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HELSINKI METROPOLIA UAS
MUSAKUUTIO + LEED AS A DESIGN TOOL

INTERIOR ARCHITECTURE &
DESIGN

IN CO OPERATION
WITH
ARCHITECTS
TOMMILA OY

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**TOMMILA** ARCHITECTS LTD

# MUSAKUUTIO

## LEED V4. AS A DESIGN TOOL

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LEED v4. as a Design Tool

*Musakuutio - Leed v4.*
*Suunnittelutyökaluna*

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# 1. ABSTRACT

This thesis investigates the connection between LEED Environmental certification and interior architecture through materials. The purpose of this thesis is to introduce our own profession and others interested into use of LEED in design. Specifying materials for a new construction project for Pop & Jazz Conservatory was done together with Architects Tommila. The material is based on BREEAM certification goals that have been implemented for the project Musakuutio by the investor VARMA. The research is districted into the interior materials, their technical requirements and the spatial needs set by the end users of Musakuutio.

Using the double diamond process as a research tool, the focus is on a result based on the users' requirements through trial and error. Research was conducted based on the third floor of the building alone in order to gain a deeper perspective into the materials used within. Based on the research of LEED v4, the materials were rated based on the three key factors that affect the scoring process. The research is conducted alongside the Finnish building standards and RT-definitions.

Scoring the materials through LEED v4 the selection of materials was easier and worked as a guideline for the design proposal. Based on the research, this thesis delivers the key factors for material specification for projects concerning interiors that are applying for LEED accreditation. The end-result includes a concept stage design proposal, the visual outlook of the chosen area and colour scheme according to the concept. Materials are justified based on their technical qualities and suitability to the concept.

# TIIVISTELMÄ

Opinnäytetyö tutkii LEED ympäristösertifikaatin ja sisustusarkkitehtuurin yhteyttä materiaalien kannalta. Työn tavoitteena on tutustuttaa niin oma ammattikunta, kuin muut alasta kiinnostuneet ympäristösertifikaattien vaatimuksiin muotoilun keinoin. LEED:in soveltaminen materiaalien valintaan toteutettiin Pop & Jazz Konservatorion uudisrakennukseen, Musakuutioon, yhteistyössä Arkkitehdit Tommilan kanssa. Työ keskittyy projektin BREEAM sertifioinnin pohjatietoihin sijoittaja osapuolen VARMAN päätöksestä. Pääpainona tutkimuksessa ovat materiaalit, niiden vaatimukset sekä Musakuution käyttäjien asettamat tilalliset tarpeet.

Tuplatimantti- prosessi menetelmän avulla työssä on käytetty käyttäjälähtöistä näkökulmaa, tavoitteena saavuttaa vaatimukset, niin LEED:in, kuin käyttäjien kannalta. Musakuution tutkimustyö rajattiin koskemaan ainoastaan LEED:in käyttöä kolmannen kerroksen sisätilamateriaaleissa tarkemman materiaaliarvion saavuttamiseksi. Tutkimuksen tuloksena materiaalit luokiteltiin kolmen tärkeimmän vaikuttavan tekijän alle niiden LEED:in pisteytyksen painoarvon mukaan. Taustoituksen apuna käytettiin suomalaista rakennuslainsäädäntöä ja RT-Kortiston ohjeita.

Materiaalien arviointi LEED:in asettamien säännösten mukaan selkeytti materiaalivalintoja ja tarjosi apuvälineen suunnitteluun. Tutkimuksen perusteella opinnäytetyö pystyy tarjoamaan keskeiset elementit joilla perustella uudiskohteiden ympäristöystävällisiä materiaalivalintoja. Lopputulokseen kuuluu konseptitasoinen suunnitelma uudisrakennuksesta rajattuun kerrososioon. Suunnitelma sisältää materiaalien arvioinnin, visuaalisen ilmeen ja värimaailman valinnan perustuen työssä määriteltyyn konseptiin. Materiaalit on perusteltu niiden teknisten ominaisuuksien sekä konseptiin sopivuuden avulla. Kaikkien materiaalien sopivuus LEED:in reunaehtoihin on määritelty.

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BACHELOR THESIS 2018
INTERIOR ARCHITECTURE & DESIGN

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# INTRODUCTION TO
# LEED CERTIFICATION
## CASE: MUSAKUUTIO

IMG 1
ARCHITECTS TOMMILA OY



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# 2. LEED AS A GUIDELINE

As a soon to be graduate I am hoping to develop a specialty within our field of design. The pressure that we as construction industry professionals have to cut down on emissions and construction waste is crucial. I personally feel we are not equipped with the right tools to function in a way that supports the green building councils' guidelines for sustainable, green buildings.

As my research so far has shown, from the department of Design there hasn't yet been a project focusing on LEED and the benefits of its knowledge, or use, in the industry. Mostly LEED has been researched by bigger construction companies concerning their processes and cost effectiveness in buildings. Construction technology and electrical engineers have taken part in research that has given companies help and understanding in the US Green Building Councils attempts to focus on more sustainable and efficient buildings.

The current building industry in Finland requires more knowledge and information about LEED in construction and ways to develop the industry towards a more sustainable approach. The urgent need for environmental standards and guidance outside the general building code and construction by-laws is necessary in this day and age considering the environmental threats our generation is facing.

## 2.1. CO OPERATION

Working together with a third-party company based on their already existing plan, I will focus on adjusting their plans according to certification measures. The goal is to create a critical document focusing on a design problem that can occur when working together with LEED certification. Pointing out the spatial and material specification challenges when focusing on sustainability and indoor air quality is where LEED can cause confusion.

LEED for New Construction focuses on the material choices and chemical avoidance that has to be considered when aiming for the highest possible scoring according to the LEED scorecard. When we are only focusing on the interiors and construction process instead of the base building structure we can research the materials used on a deeper level.

pop jazz
KONSERVATORIO

IMG 2

Metropolia

IMG 3

TOMMILA ARCHITECTS LTD

IMG 4



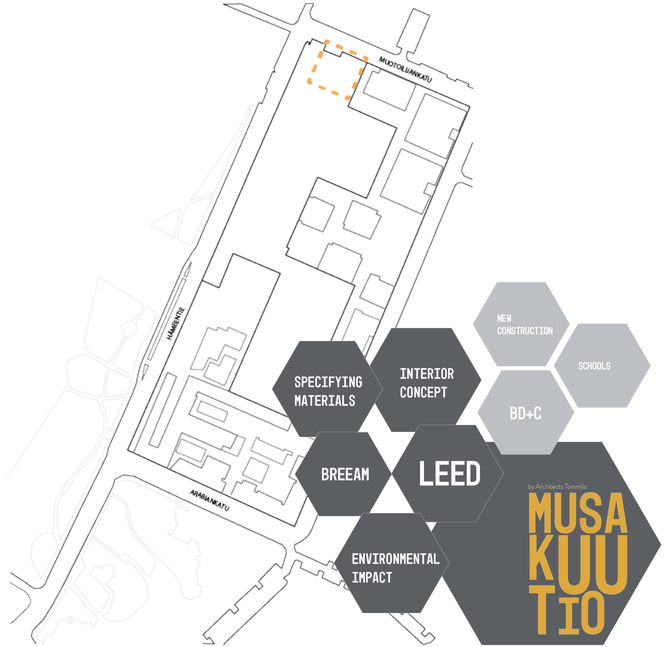


## 2.2. GOALS

The purpose of investigating the relationship between designing interiors and construction processes through LEED is to create a functional tool for other interior architects. Spreading the knowledge I have gained through my LEED AP studies I am hoping to help our field of professionals in their work by creating the key items to consider for material specification.

The meaning of this process and the end result is to create an alternative design proposal that can work as a guideline and as an example of changes needed in our design policies to achieve LEED accreditation. The importance of this research is in educational purposes for personal use and for Architects Tommila Oy will receive detailed information on LEED, environmental policies and a design proposal to continue working with.

Focusing on Musakuutio as a single project that is aiming towards an environmentally friendly recognization through BREEAM, I am hoping to achieve a design concept proposal as pleasing, both economically and environmentally, using LEED v4. as a guideline.



## 2.3. POP & JAZZ CONSERVATORY

Established in 1972, the Pop & Jazz Conservatory offers education in a variety of music schemes. As a part of the subsidue of Finnish governments educational programs the school offers degree programs together with Helsinki Metropolia UAS which focuses on the higher degree studies. A total of 120 students studying full time and with an intake of 30 to 40 new students every year the school has managed to stay as one of the top institutions for musical education in Finland (Popjazz).

As the oldest second degree institution for rhytmic music the school has broadened the education programs to pedagogy and childrens musical workshops, education and play schools. These are run outside upper degree studies and focus on music as a hobby and experimenting different instruments from early on in life. The amount of musical play school attendees has grown increasingly as the Arabia area has developed. From 200 children to a closer of 400 students in the early stages education has raised the need for additional spatial capacity.

The Pop & Jazz conservatory has framed their functions and values into four core statements that work as guidelines in their work and education.

### Student orientated workflow, creativity, mental growth and community

The story behind the staff and vision of education. Focusing on ones personal growth as a strength in teaching and supporting creative atmosphere through an open and pleasant methods is found beneficial also in the educational work. (Popjazz/arvot).

pop jazz
KONSERVATORIO

IMG 6
POP & JAZZ CONSERVATORY NEW GRAPHIC BRAND IMAGE


IMG 5
POP & JAZZ CONSERVATORY NEW GRAPHIC OUTLOOK

The new brand colours are bold and focus on the groove of jazz through a vibrant mix.

The new brand image has gathered inspiration of the early days of Pop & Jazz Conservatory and brings out the joy of music in both education and teaching. Using bright, noticable colours the new graphics focus on the positive image of the institution itself (IMG 5).

To the design proposal I am bringing in the flow from the new brand image. The flow between spaces, functions and people. Using the new brand colours in a subtle way as elements in design the new building will be easy to recognize for its users (IMG 6).



## 2.4. HISTORY

Pop&Jazz Conservatory is home to students of second degree studies, the educational staff and visitors of all ages. The spatial layout has been conducted by Architects Tommila as a part of the research of the end users. When designing for all generations and with a technical aspect of musical education the spatial layout and spaces have been thoughtout in a way that it serves as a multi-functional building. The classrooms and instrumental rooms can be reconfigured if needed. Spreading out on six floors the building will be used by both Pop&Jazz Conservatory and Helsinki Metropolia UAS .

The building will part of the Arabia 135 development which is shaping the Arabia region in Helsinki. The new block will consist of educational facilities for Helsinki Metropolia UAS, Pop&Jazz Conservatory, offices, apartment buildings and retail. The complex is under construction as the former Aalto University of Arts&Design is moving to Otaniemi, Espoo.

The old factory block of Arabia has been an important part of the craft manufacturing industry in Helsinki. Since the original purpose of the factory buildings has been transformed decades ago, the new development process is well underway. The goal of the area is to preserve the original atmosphere and industrial history in the new development. Preserving some of the historical red brick buildings of the area and demolishing some of the 1960's built additions the area is facing a big scale face lift (Kaavanro 12470 - Arabian Tehdaskortteli. S.11.).

*Hankkeesta on laadittu energia ja ympäristöselvitys (Sweco, 15.8.2017), jossa on tarkasteltu hankkeen energiantarvetta, mahdollisia energiantuotantomuotoja sekä alueen soveltuvuutta BREAM-ympäristösertifinoinnille. Simulointien perusteella alueen kokonaisenergiantarve on noin 14–16 GWh, josta lämpöenergian osuus on n. 50–60 %, jäähdytysenergian n. 5–10 % ja sähköenergian n. 35–40 %. Selvityksessä on käyty läpi energiantuotanon ja –kierrätyksen kortteliin soveltuvat vaihtoehdot. Ratkaisut ovat vaihtoehtoisia ja tulevat tarkentumaan jatkosuunnittelun aikana.*

*https://dev.hel.fi/paatokset/media/att/34/349feeb67f3f203912710b9334fac63ee134aea0.pdf*

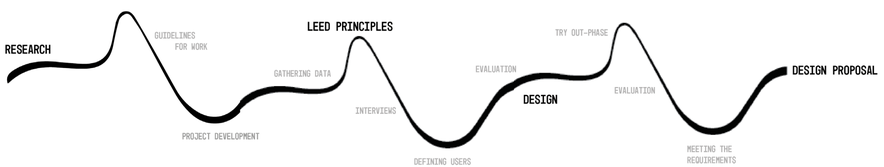
## 2.5. SCHEDULE

Research is conducted based on existing material and data concerning USGBC LEED & BREEAM certificate principles. Looking into the material and existing projects in Finland and getting a wider knowledge of successful projects is crucial to get a better perspective of the matter. Research also included interviews of construction industry professionals to gain a wider understanding of the usage of LEED in new construction projects. Getting a wider scale of material from all ends of the building industry will offer a good look into the state of LEED in Finland at the moment.

Gathering data from previous thesis projects concerning LEED and other environmental certificates in the building industry is in a key role when a certain level of knowledge of the certification process has to be obtained. Learning about the certification processes is crucial when the aim for this thesis is to achieve a design that follows the guidelines of LEED v4.

I am hoping to achieve a good example of the basics of LEED in interior construction and how to deal with projects that require the necessary attention accordingly.

As a frame, I believe the research of the wider topic will work well with the more detailed outcome. Understanding the bigger picture supports the deeper knowledge of LEED and gives an overview of other guidelines i.e. RT, in the field. Co-operation with the BREEAM consultant of the project will provide detailed insight into the world of sustainability and gives me a front-line position to foresee the challenges and difficulties when implementing an international standard together with the Finnish building code.






# 3. MUSAKUUTIO

## 3.1. EXISTING PLAN

The current site at the southern end of the block at Hämeentie 135 will be demolished (IMG 7) and re-configured as a part of the bigger development of Arabia 135 into a new housing unit.

Working closely together with the company on their plans and visions for the space and observing the balance of choices made by appearance and cost reasons. The new Metropolia Pop&Jazz Music Conservatory runs under the competition proposal name Musakuutio!(?); "Music Cube".

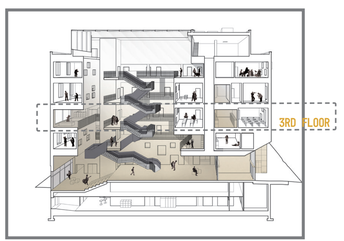
The plans for the commissioning of contractors by Varma, the investor, are in progress and the preliminary drawings have been made in order to start the bidding process. Building permit has been left for approval and the work with concept, spatial matters and more detailed drawings is underway.

The plans of the five-story new development for the use of educational purposes has been handed out to me and I was given the opportunity to choose a certain area of the project to observe with environmental standards as guidelines.

The area that I will be focusing as an example will be the Pop&Jazz educational spaces on the 3rd floor of the building. Creating an overall design proposal and material conduction for the whole floor considering LEED requirements as I contribute into the design work at Architects Tommila.

The third floor includes educational multi-purpose rooms with a traditional classroom layout, musical rooms for groups and instrumental rooms for other instruments. The gross space of the third floor adds up to 756.5 square meters. Of which the educational rooms cover almost 500 square meters. The supporting areas such as sanitary rooms, corridors and lobby areas are calculated in to the gross floor square meters. The floor area excludes lifts, staircases and maintenance and ventilation rooms.

The project is planned to begin Fall 2018 with demolition of the existing building structure on-site. There will be a BREEAM consultant present during the project that will complete the certification process and also follow the guidelines of VARMA's environmental policies.




IMG 7
ARCHITECTS TOMMILA OY

## 3.2. DESIGN DRIVERS

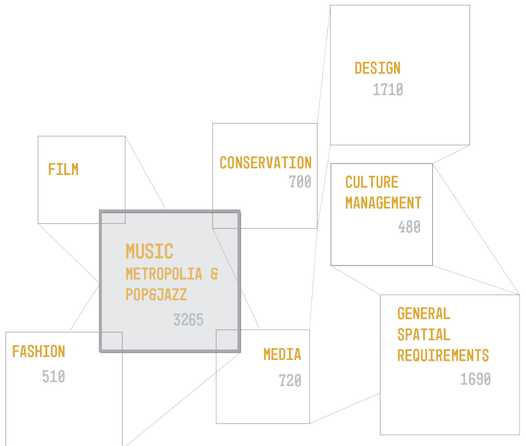
Working with the declaration certificates of fabrics, fire-proofing requirements and the ability to use them in LEED projects will be searched and cleared for the client. Indoor materials that promote good health and clean indoor-air are a main priority in the design. These will work as the two strongest qualities alongside the long life-cycle chain that this project requires for its materials.

Also, the acoustics of the building will play a major role in the design process since most of the classrooms are used for a wide selection of instrumental work. This means the structural and material selections of the building will be thoroughly searched in order to gain the best possible acoustical results. Benchmarking solutions used in other similar projects will be crucial in order to succeed.

Structural "box-in-a-box" techniques for instrumental rooms have already been included in the plans for the bidding process so the main issue will be adjusting the electrical guides, lighting and high ceilings to match the style of the building in a discreet way. Acoustical side of the project would add on a massive amount of work so I will only focus my research on what's needed to consider with materials when working with LEED v4.

As BREEAM requires, the availability of clean drinking water for everyone, in every floor must be acquired. This pushes the design to allow drinking fountains or common kitchens for everyone to use. This together with the material selection of the multipurpose classrooms, instrumental and band rooms with all common spaces, provides a guide to gain more points in the end of the certification.

The overall occupancy spatial requirements can be seen in TABLE 1.




OHM²
for Arabia 135 Development.

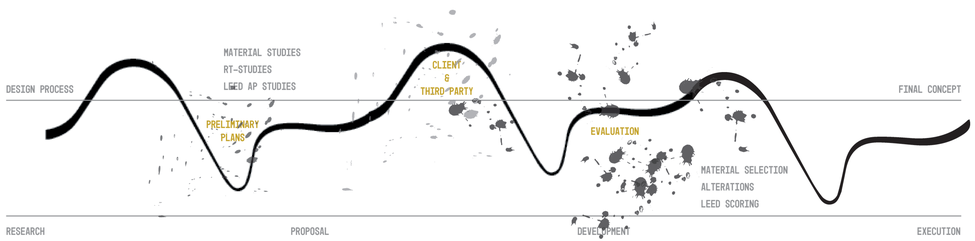
TABLE 1.



## 3.3. THEORY & RESEARCH

The double diamond design approach focuses on the design process and the two types of thinking it includes. Starting from the discovery phase and working through the definition and development phases towards the delivery of a design product, or in this case, the space itself. Developed by the British Design Council in 2005 (British Design Council), the process is widely used in product and spatial design that focuses on the beneficial design for people and their needs. The theory investigates the relationship between the customer process and the design process itself, creating a balance between the two. The development of the design runs alongside the development throughout the theory which makes it very adjustable to different types of projects.

Defining the fundamental challenges for Musakuutio works as the main process in developing the design further. Developing a method for the use of LEED v4. in interiors for the Finnish construction industry rounds up the process into a smaller guideline for material selection. Delivering the end concept for interior planning includes a specific tested and redefined evaluation of materials and their suitability. Using character profiling and a thorough process, the theory aspect of this thesis focuses on the divergent way of thinking. A broad approach to the project with consideration of possibilities and challenges leads to a convergent focus of identifying the key problems stated earlier (Jonny Schneider, 3/2015).

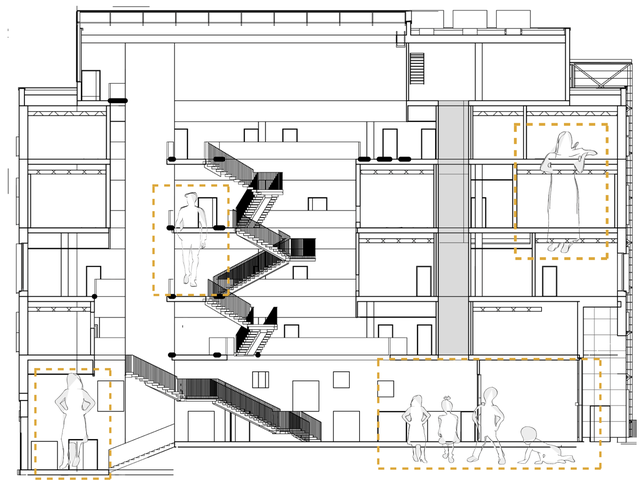


## 3.4. USER PROFILES

As a part of the background study I investigated the end users of the building and how they will move, work and play in the building. By narrowing down the users needs and expectations for the finished building in all ways, the design process was stremed lined towards a more convergent approach.

Focusing on the main issues of all users and the different needs, the material selection was summarized into the three category elements obeying LEED v4. principles.

The needs of the students and staff have been clarified in the research process prior the spatial design by Architects Tommila. Main concerns were defined in the concept statement and the co operation with the principal and other admin teams continues throughout the design. Focusing on the concept I believe the building will be enjoyed by all the end users with its personalized character.



IMG 7
ARCHITECTS TOMMILA OY



who
POP & JAZZ CONSERVATORY
**STAFF**
ALL AGES FROM 25-60
USE OF BUILDING ON WEEKDAYS, EVENINGS/EVENTS

needs
COMFORT
GOOD INDOOR AIR QUALITY
SAFE PLACE TO WORK

who
POP & JAZZ CONSERVATORY
**PUPILS**
AGES FROM 18-35
USE OF BUILDING ON WEEKDAYS WEEKENDS & EVENINGS/EVENTS
PRACTISE HOURS OUTSIDE LECTURES

needs
GOOD REHEARSAL ROOMS
SAFE PLACE TO STUDY
INSPIRING ENVIRONMENT

who
**VISITING STAFF & GUESTS**
ALL AGES FROM 20+
USE OF BUILDING DURING CLASS HOURS EVENINGS/EVENTS
BUSY

EASY NAVIGATION & SIMPLE SIGNAGE

needs
EASY LAYOUT
INSPIRING ENVIRONMENT
FRESH REPRESENTATION OF PJK

EXPECTS A "WOW" FACTOR

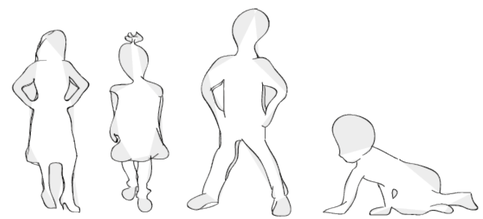
who
POP & JAZZ CONSERVATORY
**MUSICAL EDUCATION CHILDREN**

OUTSIDE OF NORMAL TEACHING HOURS AND ON WEEKENDS.

ALL AGES FROM 2-12
USE OF BUILDING ON EVENINGS, OCCASIONALLY WEEKENDS & EVENINGS/EVENTS

CLASSES ARE MOSTLY RUN IN THE FIRST & SECOND FLOOR OF MUSAKUUTIO

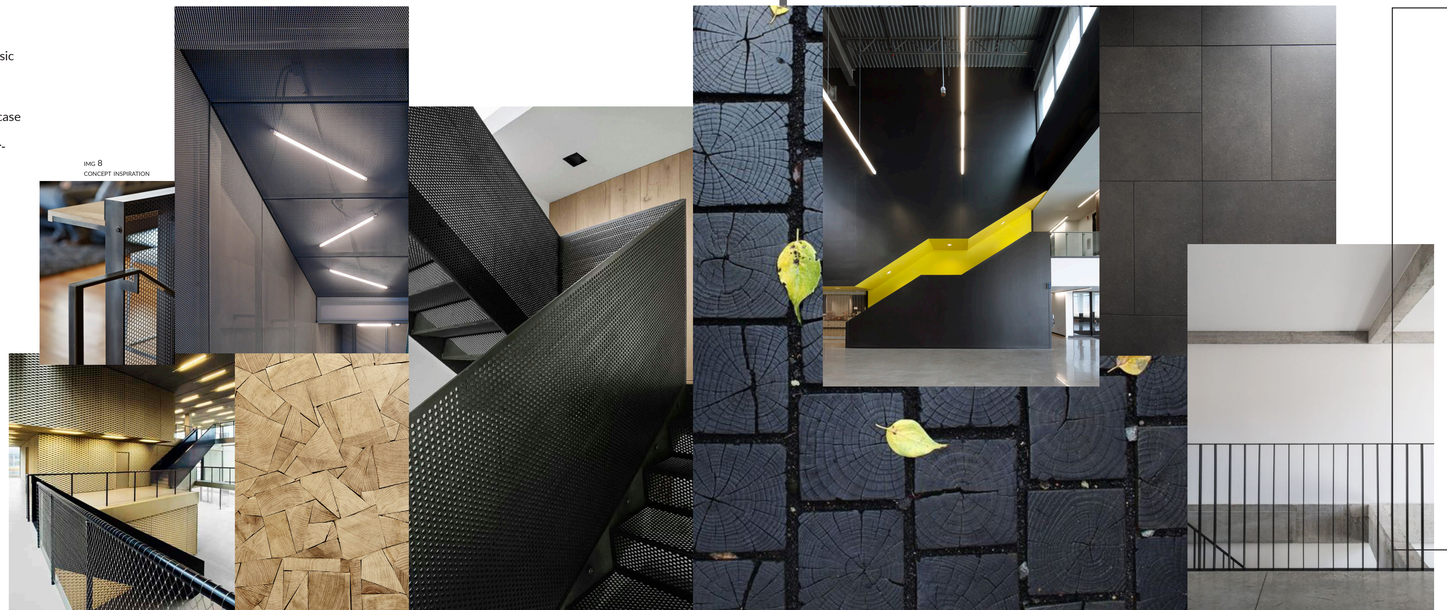
needs
SAFE SURFACES
EASY MAINTENANCE ON MATERIALS
INTEREST IN TEXTURE / SHAPES / COLOURS



# 4. DESIGN

The new construction begun from a concept of medieval music notation that is shown as vibration and resonance in the facades of the building through the window placement.

Creating intervals by placing openings and a communal staircase in the middle of the building the interior works as the instrument. Building follows a calm rhythm created by material harmony and functionality.



IMG 8
CONCEPT INSPIRATION

## 4.1. CONCEPT

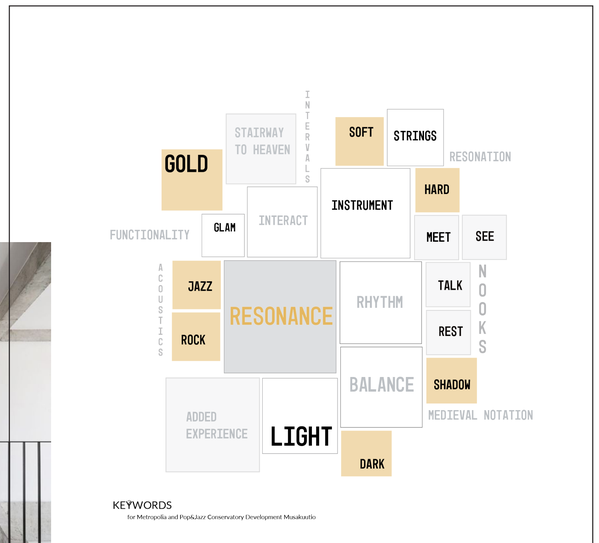
Inspiration and preliminary ideas of interior concepts were discussed with Architects Tommila and here are a few examples of my vision of what was looked at.

I am focusing on the concept

*resonance*

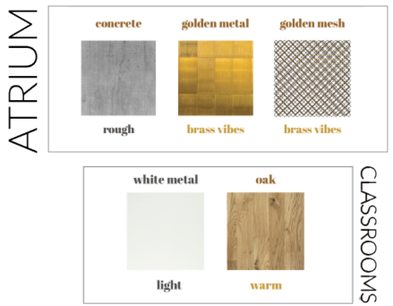
which I found the most interesting one out of the options discussed. The combination of surfaces and textures in the interios will give the design a strong character. Focus on the concepts mission of materials combining the strings of the interior to the building envelope.






KEYWORDS
for Metropolia and Pop&Jazz Conservatory Development Musiikuutio

## 4.2. THE ACT OF DEFINING




**It's a place for resonance,**

between you and your instrument, your sound and the walls surrounding you, your music with the music of the community around you, yourself with the world around you.

**It's a place for rhythm,**

daily rhythm of life, the rhythm of music.

I have divided the 3rd floor into segments of design based on their wanted atmosphere. Multipurpose classrooms, band rooms, instrumental practice rooms and common spaces such as lobbies and hallways with kitchen are consider to be a part of the plan. The additional features that will be added during this design process are the kitchenette in the student union lounge and the millwork in the lounge areas.

Planning focuses on all the materials and the purpose of these rooms. Sustainable choices are evaluated in order to achieve better indoor-air quality, comfort and easy maintenance with the benefit of a longer life span of the building.

The concept of Musakuutio defined the theme of the building being;
Resonance
- Added Experience,
moments of interaction.

Concept aims to create a calm atmosphere with a few materials in variation with texture, treatment and tone. Wood will work as an important part of the spaces bringing in the needed warmth alongside the cubic design and glam features.



## 4.3. ACOUSTICAL DESIGN

When designing musical buildings a major part of the cost of materials goes into the acoustics. In Musakuutio, the aim is create cost efficient spaces. When a huge part of the budget is for acoustical elements the materials must work in all ways in order to achieve the best possible result acoustically, visually and by their environmental performance.

The acoustical plan has been designed and approved by consultants from Akukon who work as acoustical professionals. The effect on the interiors concerning the studios, instrumental rooms and auditoriums has been checked and is being built according to the best acoustical performance.

In order to keep the cost efficiency in mind, I have chosen acoustical elements that obey the standards given but focus on the flexibility of space. In all classrooms I have used soft ceilings that work as the resonating surface through their three dimensional shape, and layout. In instrumental and band rooms the acoustics also cover wall surfaces in order to achieve resonance, absorption and reflection. In all spaces concerning this thesis the floor surfaces have been left hard, including all floating floor structures.

Acoustical performance of classrooms should be created by a variety of surfaces that resonate and absorb sounds in the best possible manner when installed in the space. For example, a classroom designed for acoustical music includes both reflecting and absorbing surfaces without forgetting surfaces that resonate sound (RT 07-10881). When looking at LEED v4, the acoustical performance should also meet the local code that has been stated in RT07-10881 for Finnish Building code.

When looking at what makes acoustical performance stand out, sometimes less is more (Steven Kleen, 2013). The used materials and variety of them usually is enough when designing basic use musical rooms. Studios and vocal rooms and drum rooms have a higher need of variation in what comes to surface and technical design. As a recommendation he suggests hard surfaces and soft ceilings in order to create spaces that work for multiple purposes acoustically. What comes to materials, the most important asset is the thickness and the performance of the used material.

The general rule in educational rooms comes down to a 80-100% of room floor surface area being acoustically optimized. When looking at the design for Musakuutio this will be achieved through wall and ceiling acoustics that have resonating surfaces, as in the surface being three dimensional instead of being a standard recessed acoustical solution.

For example the millwork placed in all common areas should also include some sort of acoustical surfaces. When furniture in a space only reabsorbs about a fifth of all noise occurred (RT 07-10881), the millwork solutions must work as acoustical elements, too. Adding perforated wood paneling, felt and other soft materials into the millwork plans the acoustical performance of the furniture mentioned can grow.

On the focus area floorplan (IMG 9), you can see the acoustically demanding classroom types and opean areas of circulation.

- **RESONANCE**
- **VIBRATION**
- **MATERIAL CONTENT**
- **VARIETY**
- **PERFORMANCE**

IMG 9 FOCUS AREAS
NTS

# 4.4. SPATIAL DESIGN

## A. MULTIPURPOSE CLASSROOMS

Multipurpose rooms are used for various different educational tasks such as teaching, lectures and also by visiting groups. Main goal in these classrooms is to provide flexible, durable and comfortable learning spaces for all ages. Considering the value of lighting, acoustics and adjust-ability of furniture will be the main focus on these areas.

These classrooms are spread out on the outer rim of the floor layout and they all have access to natural light. The amount of windows in each classrooms varies from two to 3/3.5 openings all together. The openings in the central classroom are facing the glass roofed atrium around the central staircase which allows natural light to enter interior rim classrooms. The size of these classrooms varies from 35m$^2$ to 42m$^2$, aiming to accommodate the average of 11-12 people at a time. Furniture must be chosen accordingly for alterations and adjustment for children, elderly and the students of Pop&Jazz Conservatory.

All table surfaces must meet the required 500LUX for adequate light levels. As stated in the previous, all the classrooms do have access to natural light but from the central classroom the views are obstructed which affects the scoring in category EQ Credit: Quality Views.

## B. BAND ROOMS

Band rooms are meant for educational purposes for bigger groups of instruments. These classrooms can be used for practicing, recording or band gatherings. The equipment in these rooms will play an important role in the functionality of the rooms. Bandrooms are all approximately the same size, 38.5m$^2$ with windows facing West.

Acoustically, these classrooms will be done according to acoustical standards for musical classrooms. In this case the design is aiming more detailed, and specified solutions.

The structural acoustics have been applied and my research only focuses on the surface materials that can be used as an acoustic feature in these spaces. Defining the look of the classrooms and the feel that the interior materials can provide is the goal of this design proposal.

A. MULTIPURPOSE CLASSROOMS
B. BAND ROOMS
C. INSTRUMENTAL ROOMS
D. COMMON AREAS





## C. INSTRUMENTAL ROOMS

Instrumental rooms are also equipped with acoustic wall structures for good acoustical performance. The six instrumental rooms on the 3rd floor consist of five rooms of 17m$^2$ and one smaller of 16.5m$^2$ in size. These rooms are used for individual practise and instrumental work including maintenance and adjustment of instruments. All the six rooms have a window, or windows, facing East.

Same goals as in band rooms apply for the instrumental spaces, too. The acoustical performance combined with comfortable and visually attractive interior solutions in materials are to be focused on in the design.

## D. LOUNGES & WORKSPACES

Lounges lay on both sides of the building. In the West end of the building the lobby area and in the Eastern end of the building are placed the hallway with tutoring workspaces and the student union lounge area. These spaces do all have access to natural light and are working as combining links between corridors, offering comfort and storage space.

Lounge area is yet to be designed and it is aimed to be a flexible area with softseating and comfortable atmosphere. The space is open to below on to other floors under the atrium so acoustically it will need adjustement to create a cozy nook for the students and staff.

Hallway combines East and Western sides of the building and at over 4000mm wide, offers a place for millwork and storage solutions. Design of this space will focus on the millwork and how the hallway can work as a part of the combination of spaces and provide seating, storage an visually pleasing solutions. Hallway doesn't have any openings or exits so it has the possibility to work as a tutoring space and provide storage for students, and staff alike.

Kitchenette is located in the North-Eastern corner of the building and is being added to the floor due to BREEAM's requirements of offering clean drinking water for all building occupants. Same guideline can be found in LEED v.4. so it will be added as a part of the kitchen water access. Kitchenette will need to include the basic amenities needed in a common kitchen such as a wash basin, automated water taps, counter space and cabinetry. It will work as a backup kitchen and storage for co-existing users in the close approximity of the student union lounge.

STIINA RUUSUVUORI
HELSINKI METROPOLIA UAS

BACHELOR THESIS 2018
INTERIOR ARCHITECTURE & DESIGN

IN CO OPERATION WITH
ARCHITECTS TOMMILA OY

INSTRUCTORS
MERITA SOINI
VILLE-MATTI VILKKA

# 5. ENVIRONMENTAL STANDARDS



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*"Durability.*
*Multi achieving materials and the amount of materials specified."*

# 5.1. APPLICATION PROCESS

## BASICS

Applying for environmental certifications for buildings and construction phases is becoming more and more popular also in Finland. The industry is leaping towards a more sustainable approach which can be seen as upcoming interest in environmentally friendly materials (FIGBC, 09/2013). Most of the basics of these environmental building standards such as LEED, BREEAM, LBC and WELL have already been covered in the basics of architecture. Architects will have to consider the site placement, daylighting layout and issues including thermal design and flow of air through our buildings from early stages of design. Today's standards modify and push these rules from a design point of view to a mandatory acknowledgement considering health, energy efficacy and sustainability.

When our buildings produce over 30% of all the carbon emissions in Finland and over 40% of our energy consumption comes from buildings alone (FIGBC, 09/2013), it is important that the building industry from designers to developers understand the importance of material recycling, re-use and the impact of material selection. The ability to give building occupants control over interiors is a crucial aspect in our future work as designers. Like Agneta Ghose described, the holistic way of looking at our buildings is an important way to develop the industry.

## BENEFITS

Some of the time the certification process is seen as an extra cost for the developer and client. When looking at the benefits that are followed the additional cost to construction budget is gained back as an investment to the future. When investing into green buildings and spaces we can gain revenue and build healthier buildings for our companies, families and staff. Looking at the cost reasoning from an investors point of view when the benefits of reputation, positive attitude change and future low-cost maintenance through energy efficiency is worth more than the investment ever will be.

Industry's old habits and attitudes towards environmental standards have been shifting towards a more sustainable way of approach. This has led to the growth of certifications and the amount of projects been registered for accreditation (Parkin Blog, 08/2017). The bigger influence comes as benefits in risk management and environmental influences for both the industry, and the client and investor. Beneficial energy consumption and image of the construction company are seen as the biggest win-wins in the field.

As an example, in Canada the green building industry has bloomed for years. According to the report (Parkin Blog, 08/2017), 86% of building owners and investors believe that better performing buildings are the biggest benefit in certifications. The help of the certifications gives clarity, and a strong belief in better money return on a investment that happens to be green. By promoting the well-being of occupants it creates a perfect balance for investments and people to flow together in buildings.



# 5.2. CERTIFICATION

The process of applying for the certification in new construction can be divided roughly into four stages in all commonly used standards. These stages are followed through the construction period and finalized by the BREEAM inspector or checked by a LEED professional at USGBC in order to gain the final proof of certification.

Firstly, the development & design process focuses on the goals of the project and aim towards certain credits that can be achieved during construction. In the first stage the projects are acknowledged in the right category and registered for the evaluation process. This can be done by the BREEAM professional or a member of USGBC for LEED.

Second phase sets out the goals and begins the documentation alongside reporting to the main certification organization. The construction team in charge of the certification process provides the registered project team reports during the construction. When the goals of the project have been set in the first stage as part of the project development the design process can begin with the tools of the certification. This minimizes risk and offers a good project image to complete the project within the certification guidelines.

The third phase includes the building process and documentation of the used techniques, materials and development of the site. The development of the construction itself is reported throughout the stages of construction to the person in charge of documentation during the project.

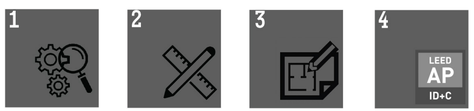
In the last phase the building is been granted use and is followed and audited to gain the actual certification and final report of the buildings efficacy and energy loads. After being checked by professional from the building code team and certification lead the site can be certified based on the points scored after the conclusion of project.

*"Building sector is projected to have has the largest potential for reducing climate change impacts. Sustainability moderators of modern buildings such as BREEAM(UK), DNGB (DE) and LEED(USA) are the forerunners of driving life cycle assessments in the building industry. These standardization measures are widely recognized as they provide a*

*holistic approach to the building's environmental performance.*

*and score them on a broad range of categories. They include a broad energy use, health and well-being, material use, waste, transport and management processes."*

– Agneta Ghose – Life Cycle Assesment of an Active House 2012, P.58



# 5.3. LEED V4

## BASICS

Leadership in Energy & Environmental Design has been developed by the U.S. Green Building Council (USGBC). USGBC controls and develops the certification accordingly every year and updates their guidelines according to the needs and benefits of more sustainable buildings and construction. U.S. Green Building Council is a third-party organization that gives transparent guidelines for real-estate owners, contractors and residential developers to improve their construction processes and create efficient and environmentally friendly buildings.

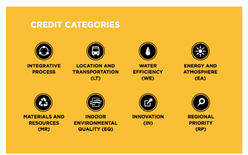
Of which my thesis work will focus on new construction. This draws a line between the need of understanding the difference in guidelines specially in commercial interiors. As a part of my personal goals in achieving the LEED Green Associate credentials in the future the outline was drawn around commercial project categories. Keeping a general view into the principles of LEED, the BI+C works in favour of being the most commonly used category in new buildings.

Explaining the base structure and scorecard for LEED projects and the process has to be done in order to get a wider understanding of the topic. Though I will not go into detail with each category the overall structure and scoring has to be understood before focusing on one subcategory. All of the scorecards work in symbiosis and it is important to understand all aspects of it in order to achieve a valid estimate of points scored (IMG 10).

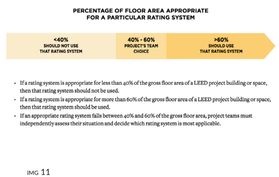
## LEED RATING SYSTEM

I have narrowed my topic down by choosing only one certification process. Working with an existing space also limits the possibilities and provides certain limits for construction and renovation within the Finnish building code and by-laws. Case Musakuutio qualifies for the LEED New Construction category which is one of the nine different project categories available.

When choosing the category the options were to focus either on the LEED for Schools or LEED for New Building & Construction. I decided to focus on the LEED BI+C even though the project would have qualified to the LEED for Schools since the percentage of educational class square footage in Musakuutio covers the demanded gross floor area of a school project (IMG 11).




IMG 10




IMG 11



## SCORING

Scoring happens based on the chosen category for the project and the scorecard evaluation based on the construction report done by a LEED accredited professional. These categories are then scored based on the nine subcategories seen in (IMG 10). Points vary depending on the category and some do offer options for compliation, or work as pre-requisits in order to apply for LEED accreditation.

In the Musakuutio project I am focusing on the points scored in categories Materiasl & Resources and Indoor Environmental Quality. This is made in order to focus on the effects of interior material choices and to compare the materials available. Energy and atmosphere, Regional priority and Location & Transportation have already been set in the mapping stage of the development and I will not interfere with these categories.

The goals is to gain most of the points in Materials (13) and Indoor Environmental Quality (19). I will go through the steps and sub-categories that I will only briefly adjust and the ones that will meet the full criteria of scoring the needed points.

Clearly the project can already been seen as a Very Good- level BREEAM project due to its aim for the certain level of certification. This can help out with LEED documentation with existing data on occupancy, energy effiency and waste management.

| | BREEAM | LEED |
|---|---|---|
| DATE INTRODUCED SCHEME | 1990 | 1998 |
| | COMMUNITIES MASTERPLANNING | NEW CONSTRUCTION |
| | INFRASTRUCTURE CIVIL ENGINEERING & PUBLIC REALM | EXISTING BUILDINGS: OPERATION & MAINTENANCE |
| | NEW CONSTRUCTION HOMES&COMMERCIAL BUILDINGS | COMMERCIAL |
| | IN-USE COMMERCIAL BUILDINGS | INTERIORS |
| | REFURBISHMENT & FIT-OUT HOMES&COMMERCIAL BUILDINGS | SHELL & CORE |
| | | SCHOOLS |
| | | RETAIL |
| | | HEALTHCARE |
| | | HOMES |
| | | NEIGHBOURHOOD DEVELOPMENT |
| CATEGORIES | Management<br>Health and well-being<br>Energy<br>Transport<br>Water<br>Materials<br>Waste<br>Land use<br>Pollution<br>Innovation | Location and transport<br>Sustainable sites<br>Water efficiency<br>Energy and atmosphere<br>Materials and resources<br>Indoor environmental quality<br>Innovation<br>Regional priority |
| RATING SYSTEM | PASS<br>GOOD<br>VERY GOOD<br>EXCELLENT<br>OUTSTANDING | CERTIFIED<br>SILVER<br>GOLD<br>PLATINUM |
| ASSESMENT BY | TRAINED ASSESSORS | USGBC |
| CERTIFIED BY | BRE | USGBC |
| CERTIFIED PROJECTS AS OF JAN 2018 | 563 000 + WORLDWIDE | 92 000 + WORLDWIDE |
| | STRICT REQUIREMENTS<br>COMPLEX SYSTEM<br>COST OF PROCESS | BASED ON US LEGISLATIONS<br>AMOUNT OF DOCUMENTATION<br>ASSESMENT AUDIT IS NOT INDEPENDENT |
| | ALLOWS OTHER BUILDINGS TO BE BENCHMARKED & COMPARED<br>AUDIT INDEPENDENT<br>BASED ON UK LEGISLATION | MARKETING<br>AMOUNT OF INFORMATION AVAILABLE<br>ASSESSOR AND TRAINING NOT NEEDED TO REGISTER PROJECT |

BASED ON:
https://www.bsria.co.uk/news/articles/breeam-or-leed-strengths-and-weaknesses-of-the-two-main-environmental-assessment-methods/
Updated version based on LEED v4 2017 & BREEAM 2017 by S.Ruusuvuori, Jan. 2018.

TABLE 2

## 5.4. BREEAM

Mostly used in Europe, the British originated environmental certification stands for a very similar matter in buildings as LEED. Like its younger American version, it has been divided into different categories based on the project type, focal points and process. The categories include more detailed paths of accreditation that adds up to the final scoring for a BREEAM certified building.

As the oldest environmental building standard BREEAM has gained a strong footing all over the world. Most of the projects can be found in Europe but the certification has spread to over 70 countries worldwide. In Finland, BREEAM certification has been granted for over 170 projects.

As seen i the estimation graphic (TABLE 3), the goals and aimed scoring was decided based on BREEAM International New Construction 2016 agenda. The anticipated result is exceeding the Very Good level of the standard and the alterations for the design have been made according to these regulations. Consultants guidance has offered tips relevant to bicycle parking that is missing from the location and the needed staff amenetie such as water access and equal washrooms and shower facilities.

*Further on this thesis I will showcase ome of the equivalent BREEAM categories in LEED accreditation. These are not directly usable in any matter but will show the basic structure and definition of both standards.*

## HANKKEEN TILANNE

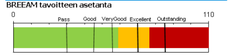
RAMBØLL

BREEAM® International New Construction 2016

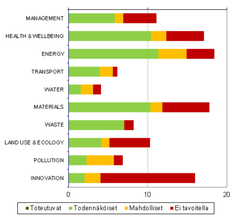
**BREEAM® International New Construction 2016**

**Arabia Musiikin uudisrakennus**
Helsinki
Vaimia

**BREEAM tavoitteen asetanta**




| | Toteutuvat | Todennäköiset | Mahdolliset | Ei tavoitella | YHTEENSÄ |
|---|---|---|---|---|---|
| MANAGEMENT | 0 | 11 | 2 | 8 | 21 |
| HEALTH & WELLBEING | 0 | 11 | 2 | 5 | 18 |
| ENERGY | 0 | 16 | 5 | 5 | 26 |
| TRANSPORT | 0 | 7 | 3 | 1 | 11 |
| WATER | 0 | 3 | 3 | 2 | 8 |
| MATERIALS | 0 | 7 | 1 | 4 | 12 |
| WASTE | 0 | 6 | 0 | 1 | 7 |
| LAND USE & ECOLOGY | 0 | 4 | 1 | 5 | 10 |
| POLLUTION | 0 | 4 | 6 | 2 | 12 |
| INNOVATION | 0 | 2 | 2 | 12 | 16 |
| YHTEENSÄ PISTEITÄ | 0 | 71 | 25 | 45 | 135 |
| YHTEENSÄ % | 0 % | 59 % | 18 % | 39 % | 110 % |




Pass: ≥ 30%, Good: ≥ 45%, Very Good: ≥ 55%, Excellent: ≥ 70%, Outstanding: ≥ 85%

**Hankkeen odotettu tulos** **58,87 %**

**Yhteenveto projektitilanteesta:**

**Toteutuvat:** Nykyisellä tiedolla varmasti saavutettavat pisteet
**Todennäköiset:** Arviosanaoddutukseen sisältyvät, yhä osin avoimet pisteet
**Mahdolliset:** Hankkeessa saavutettavissa, mutta vaatii merkittävää toimenpiteitä
**Ei tavoitella:** Ei mahdollinen tai tavoitteltava hankkeessa

RAMBØLL

TABLE 3
RAMBOLL EVALUATION + PROJECT PROGRESS



### COMPARISON

Major difference between the two comes in the actual certification process where the processor needs to be a BREEAM consultant themselves. This gives the projects applying for BREEAM the pressure on their budget and the knowledge found through consultants. As LEED is not too well-known yet in Finland either, the consulting services are booming in the field.

Like Jonna Seppänen, the BREEAM consultant working on the project from Ramboll stated; "*It is quite easy to get LEED Gold and BREEAM Very good levels of certification in Finland following the regulations and best way of practices in Finland. For example the EPDs (Environmental Product Declarations) are now more common and I would say that the need of those for certification projects is one of the reason for that.*"

The different scoring categories of LEED have also been based on the older BREEAM system that was updated most recently in 2016. As seen in TABLE 2 the similarity is very noticeable. Energy, Water, Innovation and Materials are basically the same credits in both. The Waste and Management categories are combined into one in LEED v4 and it also incldues the BREEAM Pollution category. Land Use and Transport are qualified together in LEED v4. too as the Location & Transport credit. The Health and Wellbeing category is not under LEED as an individual but the same matter has been introduced within materials, land use and innovation.

## 5.5. RT-LEGISLATION

Finnish building industry heavily depends on RT-Kortisto which stands for Construction Information guidelines. These criteria are followed with its by-law standing in our building industry. Inspectors rule out the miss use of building code and provide more detailed insight in our construction and renovation projects. To be able to pass the finished construction inspections, projects and sites have to have followed code and all buildings permits according to plans.

The strict building codes (RT) of Finland create a good starting point to focus on more sustainable techniques, energy savings and material choices in our buildings. Working with these mandatory guidelines we can easily reach lower LEED & BREEAM standards without even knowing about it. The importance of knowledge comes in when applying for a certificate and comparing the difference between certification levels. For example, gaining a LEED Silver certification by following the investors personal environmental policies and the RT building code in Musakuutio is not far out of reach. Looking further up on the scale we can adjust the plans accordingly to reach the Gold & Platinum levels. Focusing on interiors and the materials used we can gain more points very easily when preferring local and sustainably harvested and produced materials.

The newer addition to RT-Kortisto is the RTS classification that stands for environmental ratings. It was created alongside the traditional RT to promote good and sustainable buildings, urban planning and real-estate maintenance that work as the front line of sustainable Finnish buildings. RTS works together with the building code in a more environmentally friendly approach.

## 5.6. LEED CERTIFICATION ESTIMATE

As a part of the LEED documentation all materials must declared and shown as transparent from their manufacturers side. The raw-materials have been sourced and extracted responsibly and have been recognized by a third-party. Alternatively, minimum of 25% of the materials used in the project are bio-based, certified FSC wood, reused or recycled or approved by USGBC. These actions are calculated based on their weighing and adjusted if sourced within a 160km radius of the project site for more value (LEED v4 for Building Design and Construction, 10/2018).

The concept Resonance pointed the design towards materials such as metal mesh paneling, metal string, wood and the balance of soft and hard surfaces especially in the studios and acoustically challenging spaces. In the following I will be comparing the possibilities of different design approaches to reach the highest possible LEED v4 points. As seen in Table 4, I am aiming to achieve 10/13 Points in the Materials & Resources (MR) Category and 13/16 Points in Indoor Environmental Air Quality (EQ) table 5.

*I will not take a stand for scoring categories which don't relate to the interior material selections. The scoring achieved is an assumption of points scored with materials chosen and it has not been sent for evaluation by USGBC.*

| Materials & Resources (MR) | | Maximum Score | Points Aimed for | Explanation |
|---|---|---|---|---|
| Prerequisite | Storage and Collection of Recyclables | Required | Required | Waste management plan shown with placement of storage, collection etc. |
| Prerequisite | Construction and Demolition Waste Management Planning | Required | Required | Millwork planned in order to minimize waste & raw-material. construction demo waste planned to minimum. |
| Credit | Building Life-Cycle Impact Reduction | 5 | 3 | LCA for the whole building - done by BREEAM/VARMA 3 points |
| Credit | "Building Product Disclosure and Optimization - Environmental Product Declarations" | 2 | 1 | EDP( environmental product declaration) OR LCA matches ISO 14044 OR third-party certificate 1 point |
| Credit | Building Product Disclosure and Optimization - Sourcing of Raw Materials | 2 | 2 | All wood FSC, choosing bio-based materials 1 point. Min. 20 products with raw material report (GR, OECD, ISO 26000:2010) 1 point |
| Credit | Building Product Disclosure and Optimization - Material Ingredients | 2 | 2 | Showcasing material chemical content 1point. Green screened/ CC or other USGBC 1point. |
| Credit | Construction and Demolition Waste Management | 2 | 2 | Plan & Execution Documentation |
| | | **13** | **10** | 10/13 |

table 4
materials & resources credit evaluation

In the Materials & Resources credit the aim is se quite high due to the few materials chosen. Benefiting from existing structural framework as a finish through final finishing the need for more materials is ruled out. As I mentioned previously, the tables 4-5 gather the needed data and documentation needed to apply for the score.

Building Life Cycle Impact is basicly impossible to achieve fully in a new construction project. The factor evaluates the damage and carbon emission take on the environment which is higher when building new. If the project would be a renovation, reuse project or refurbishing, it coul gain the full score. For example, the Helsinki Metropolia UAS new premises on Hämeentie 135 would count as a use of existing building structure and envelope. The mentioned project could qualify, if properly executed, for full 5 points in the first sub-category.



The Building product disclosure and optimization sub-category I have rated to aim for 1 out of 2 points. The category requires full product disclosures or other certificates to prove the background and materials used in the process and harvest of product. I decided to not proceed with the goal of full points hence the difficulty of gathering this data from local producers and smaller companies.

I will keep the credit as a guideline when choosing materials and will implement materials and manufacturers that do provide the required information in order to achieve this credit.

| Indoor Environmental Quality (EQ) | | Maximum Score | Points Aimed for | Explanation |
|---|---|---|---|---|
| Prerequisite | Minimum Indoor Air Quality | Required | Required | Performance aimed at S1 Finnish Indoor Air Quality Levels (S1 being the highest rating in interiors) |
| Prerequisite | Environmental Tobacco Smoke Control | Required- | Required- | Non-Smoking Building & Premises. |
| Credit | Enhanced Indoor Air Quality Strategies | 2 | 2 | Consulting BREEAM Ventilation plan and calculations in order to gain the answers for LEED, similar strategy. According to LEED; All entryways will be equipped with grilles and/or roll-outs to stop dirt and bacteria exposure to the indoors. |
| Credit | Low-Emitting Materials | 3 | 3 | All VOC levels tracked and documented. Furniture has to be certified ANSI/BIFMA or an equivalent EN-Certification level. Material emissions evaluated and checked to match both LEED v4 and M1 clarification with Finnish manufacturers if needed. |
| Credit | Construction Indoor Air Quality Management Plan | 1 | 1 | Plan before construction and occupancy of indoor air management and how it is evaluated. BREEAM deals with the same matter as well so the data concerning Muiskaustio project and Air Quality Management should be available on request. |
| Credit | Indoor Air Quality Assesment | 2 | 2 | Out of the two options, planned control visits and measurements after occupancy and throughout the stages of development. Checking Indoor Air Levels like in the Finnish S1 system clearance that is aimed at, too. |
| Credit | Thermal Comfort | 1 | 0 | Not applicable for Interior Material Selection. |
| Credit | Interior Lighting | 2 | 2 | Controllable and High Quality Lighting System is achievable through technology and choices made with cost, required LUX and controllable lighting scenario alternatives. |
| Credit | Daylight | 3 | 2 | Not applicable for Interior Material Selection. Estimate of two LEED v4. points due to BREEAM planning that has discussed the matter that some of the everyday use - spaces lack direct sun exposure. |
| Credit | Quality Views | 1 | 0 | Not applicable for Interior Material Selection. |
| Credit | Acoustic Performance | 1 | 1 | All acoustical plans have been completed with an Acoustics Professional due to the high level of acoustics needed, aiming for full points in LEED, too. |
| | | **16** | **13** | 13/16 |

table 5
INDOOR ENVIRONMENTAL AIR QUALITY CREDIT EVALUATION

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HELSINKI METROPOLIA UAS

BACHELOR THESIS 2018
INTERIOR ARCHITECTURE & DESIGN

IN CO-OPERATION WITH
ARCHITECTS TOMMILA OY

INSTRUCTORS
MERITA SOINI
VILLE-MATTI VILKKA

# 6. BENCHMARKING



STIINA RUUSUVUORI
HELSINKI METROPOLIA UAS

BACHELOR THESIS 2018
INTERIOR ARCHITECTURE & DESIGN

IN CO-OPERATION WITH
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INSTRUCTORS
MERITA SOINI
VILLE-MATTI VILKKA

*Benchmarking - The power of learning from the big guys for your own benefit.*

## 6.1. LOCATIONS OF INTEREST

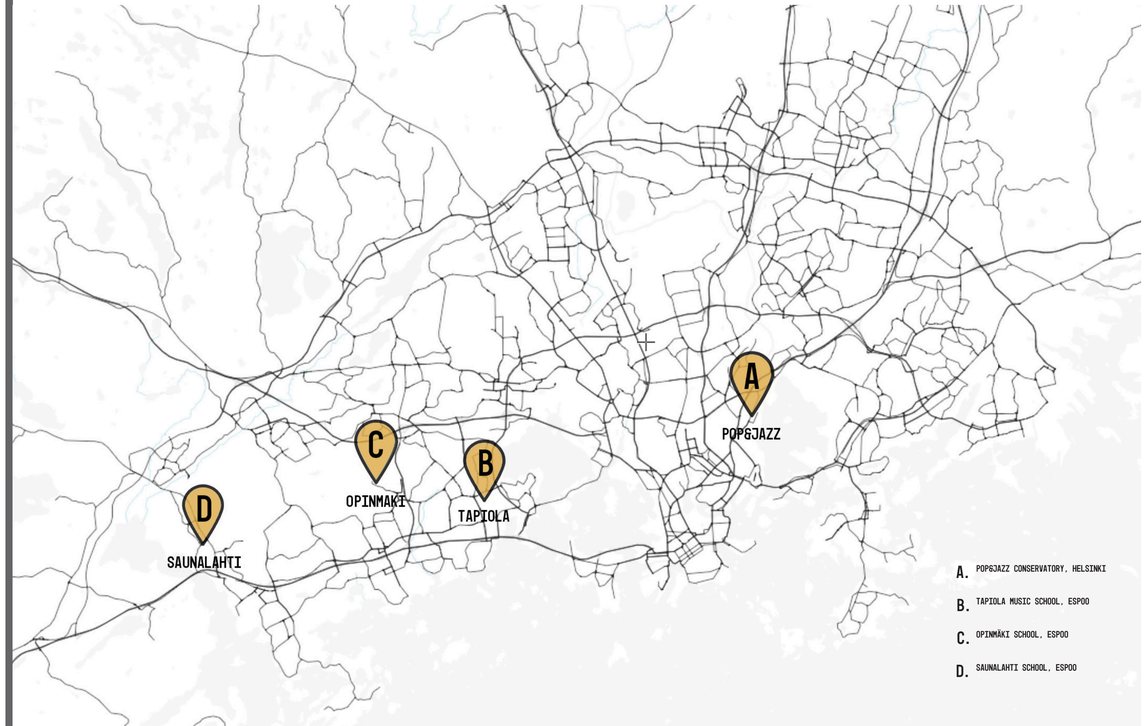
Beneficial projects concerning the new Pop&Jazz Conservatory building will be other newly built multi-purpose and educational buildings such as schools, libraries and auditoriums. I will be benchmarking a few recent projects from the educational side to gather more material on the used interior layouts and natural materials used. As seen further on, the buildings all have certain characteristics that can be combined into the design proposal for LEED approved materials in Musakuutio.

Saunalahti & Opinmäki Schools in Espoo and the recently renovated Secondary & High School in Tapiola that focuses on instrumental studies, will show examples of **material selections and acoustical work in classrooms.** There are a few educational buildings with the highest LEED certifications internationally that can also be used as background information concerning the new Pop&Jazz Conservatory building. These projects can give some inspiration and crucial **material guidance** when it comes to selecting the right materials that serve the needs of the students in Arabia, Finland, too.

The buildings are taken into consideration as separate projects, that do not fill the full criteria of the Pop&Jazz Conservatory project. They are examples of good engineer work and use of **sustainable materials and acoustic solutions** in educational spaces. When observing the buildings I paid attention to the **use, and amount of, materials** used for acoustical purposes and the overall feel of the instrumental rooms.

- ACOUSTICAL SOLUTIONS
- USE OF STRUCTURAL SURFACES
- MATERIALS USED
- USE OF NATURAL LIGHT
- LIGHTING SOLUTIONS





## POP&JAZZ
# A.

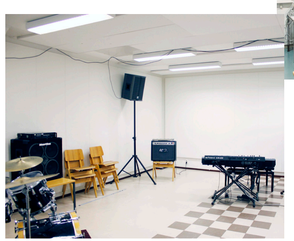
The general musical education rooms (IMG 13) are kept white and plain, with the acoustical paneling focused on the upper wall sections and tiling on the recessed ceilings. Lighting has been executed as **direct-indirect for better visual comfort**. In the smaller instrumental rooms such as piano, singing and other keyboard instruments the acoustical wall panels have been covered with a perforated metal sheeting (IMG 15) that resonates due to its curvy shape. This is something that can be looked at when specifying the instrumental and band rooms at Musakuutio on how to create **surfaces that resonate the sound** better. In the current building this has only been done on the middle part of the wall which leaves the edges of these sharp panels exposed that can create a hazard.

Looking at the common spaces and bigger educational rooms such as the *Gallery* (IMG 14), the character of the building has been introduces also to the inside. As a great space the room works as a smaller event room for concerts, meetings and instrumental classes.

The acoustical performance in this space has also been altered due to its multipurpose use. The white door-like structures have been brought in later on to work as a better acoustical platform for drums and other percussion instruments. This space has been very liked due to its amazing brickwork and the heritage that the protected  building has. Despite this, the acoustical performance of the space has failed to meet the standards for hosting musical activities.

IMG 11

IMG 12

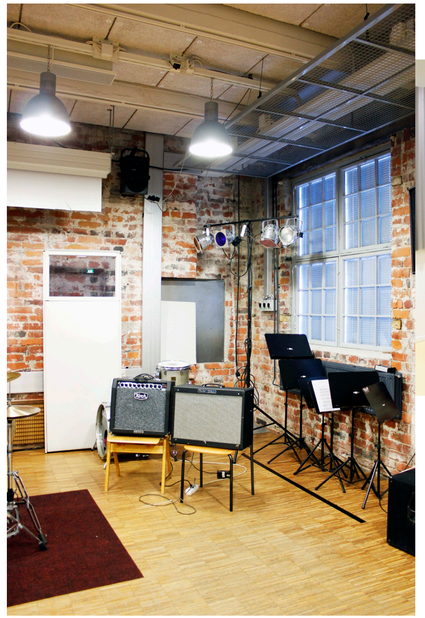


IMG 13



At *Klubi* (IMG 11), the classic squared two-coloured vinyl flooring reminds of the buildings early days and is mixed with older educational furniture, well known to everyone who has participated in primary schooling in Finland in the 90's.

Combining these factors it is clear to me that the materials have been a **representative of their time** and the heritage of the building. What they do lack, is the acoustical performance and environmentally friendly solutions. This has to be discussed when planning the new building and the materials. Bringing the loved brickwork to Musakuutio featured as patterns and shapes of new finishes. The style of the furniture originally used in Arabiankatu 2 will work as a reference of style, time and place.



IMG 14

IMG 15

## TAPIOLA

# B.

After an extensive renovation of the old 1960's built premises the building is back in its original state including the renovation of the extensions from the 60's and 80's.

Designed within the new wave of schools, the architect Jorma Järvi, created a bold experiment for the Finnish schooling institution at the time. Musical specialty was taken into a part of the curriculum in the late 80's and has kept a strong footing in the ever developing competiton between Espoo High Schools. As a major part of the Tapiola Garden City, the building was preserved due to its big impact on the landscape and the originality and character of Tapiola (Tapiolan Lukio).

After the massive 32 million euro renovation (20.06.2016, Länsiväylä) was finished in 2016 the school has developed a modern look without compromising the existing architecture. The whole building was reconfigured due to the excessive indoor air-quality problem and mold yet still the hexagon class rooms spread out to the courtyard. The details found in window sills and tilework have been restored with new materials with an eye on the old.

Due to the large amount of musical studies that are taught in Tapiola I wanted to explore the solutions made during the renovation phase. All the classrooms have been re-furbished during the renovation and the acoustical solutions have been thought in a way that they are multi-functional and work for all kinds of instruments, vocals and recordings. The similarities in **indoor air-quality management and instrumental work** make Tapiola a good reference point for the design of Pop&Jazz Conservatory.

The two types of classrooms found in Tapiola vary a bit in size and equipment. The smaller (25m$^2$) recording studios have been acoustically altered to work with the best possible recording environment for multipe instruments. The bigger classrooms are used for other functions, too, such as general music classes and lectures.

The storage issue has been solved with **cubical locker systems** made of metal. These are also coloured according to the surrounding space and code, here an example of the yellow themed lockers (img 16). The common areas are colourful yet very simple (img 17).

img 16

img 17

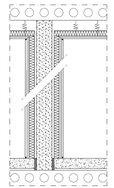


Introduced to me by the High School Music Teacher Aleksi Ojala, it seems like the new school building and especially the acoustics have been a long waited solution to the previous problems. The long evacuation has paid back in good acoustical solutions that have been configured with heavy acoustical curtains, various acoustical wall panels and basic acoustical ceiling system (img 22).

The used acoustical paneling in instrumental rooms is a 40mm panel, attached on to the wallsurfaces as a separate panel combination laying on hinges for **easy adjustment** (img 18). The ability to move the paneling into different configurations creates alternative resonating surfaces that can improve the acoustical ability of a space. Same technique was also used in the big auditorium (img 21). The rooms had a plain white panel colour to match the base wall. The layout was even throughout the room with a simple 100mm gap between panels. Manufacturer of these panels is unknown so to get a better idea of the possible LEED rating they would have to be clarified and the origin would need to be checked for transparent materials.

As already defined, the Pop&Jazz Conservatory will be using a structural "box-in-a-box" technique in all the instrumental rooms which includes a heavy load of acoustical material on the walls and an airgap between the ceiling structure and suspended acoustical tile (img 20). The instrumental rooms in Tapiola are **double insulated** for good recording acoustics (img 19).

img 18



img 20

img 21

img 19

img 22

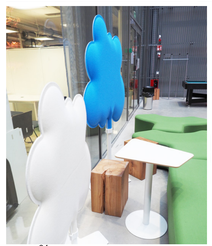
# OPINMAKI
# C.

Opinmäki School complex **mixes different users and spaces** together in a modern educational building in Espoo. The newly built premises don't really remind the typical school buildings in Finland. Completed in concrete and big **raw surfaces**, the architecture by Verstas Architects reminds more of a gallery type of a space. The different aged pupils, city library and youth center spaces are connected through a big lobby area with the main stair (IMG 26) to the main dining hall.

The auditorium has acoustical paneling (IMG 23), that works as an **artistic element** but also as a good resonating surface. The shape and layout of it is clever and it could work as an example for the project in acoustical wall art configuration. Otherwise it could be stated based on the comments from staff and personal observation, the acoustical planning of the school was not thought-out thoroughly.

The kindergarten with **wooden wall paneling** and lower ceilings was a pleasant space to interact and communicate with what comes to the acoustical performance of the space. Added acoustical elements did contribute to the spaces and their functionality especially in the library where the colourful reading area targeted for children seemed to be a hit (IMG 24 & IMG 25).The Finnish furniture company Isku is behind the **colourful acoustical panels** called Mukula that are installed in the library. These also work as seating when detached from the wall panel. Multipurpose **furniture that can be re-configured** will be a key in Musakuutio, too.

IMG 23



IMG 24

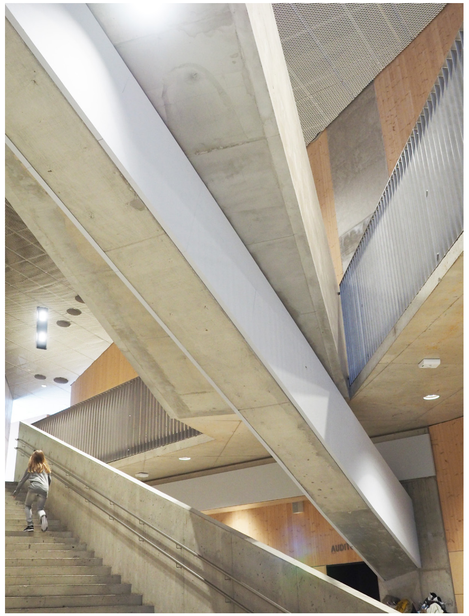
IMG 25



When examining the acoustics of the space you can see that it was not considered during the construction phase. The acoustical panels attached to the concrete pillars (IMG 33) were added afterwards after the noise impact was measured and proven to be too high. Classrooms and the library had additional acoustical elements such as wall panels, room dividers and thicker acoustical curtains.

In Opinmäki the overall result is very high considering its a primary school. More of an art gallery feel to the space only gives hints of children involved when the drawings and works of students are glued to the well thought concrete surfaces. The rough **concrete surfaces** and use of **wood in millwork** can work as reference for Musakuutio, too. The combination of the two works in favour of the space and overall feel of it.

Obviously the aocustical side of the building does not meet the requirements and has been improven afterwards. Children, the loudest of the users, have caused the whole building together with architecsts to rethink the acoustical arrangements. In the dining area the ceiling rises well above 10m above the floor surface, reminding of the Musakuutio atrium, the acoustics are poor with no recessed acoustical materials or wall features. Both of these can easily be adressed in Musakuutio with the right placement and discussion of panel placement. Working together with the Finnish Building code instructions the acoustical result can be achieved in Musakuutio and the mistakes made here, wont be repeated.



IMG 26

## SAUNALAHTI

# D.

Saunalahti School is an example of new modern Finnish school architecture. The school was taken into use in 2013 and the contractor YIT was awarded the **Environmental Building** of the year 2013 (Palkinnot, YIT).

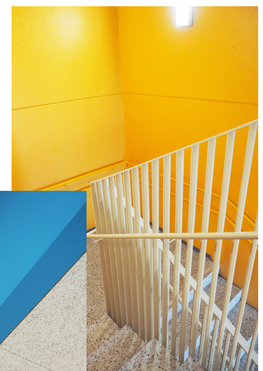
The award was given based on the **uniform use of material** and landscape design that promote good design, functional and long lasting solutions. The building is categorized as an A-Energy Level Building and is heated by district heating (Projektiuutiset 6/2012).

This project was selected as one of the locations of interest due to its harmony in interiors and the material choices used, both raw-materials and added furnishings. The concrete surfaces are bigger than what is planned for Musakuutio but the idea of exposing the structural detail in the interiors in a modern context works both ways (IMG 28).

When looking at the **balance** between the rough surfaces of concrete and the use of wood, the resembelance to Musakuutio can be seen. When planning the wooden slab details for the project we can look at Saunalahti School for detailed use of wooden ceilings and details (IMG 27).

IMG 27

IMG 28



IMG 29



IMG 30

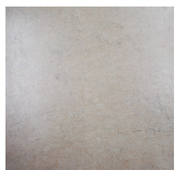
As an energy efficient building, the material selections were an interesting look in to the buildings functionality. The big surfaces of wood slabs on the ceiling and the polished concrete in the main dining hall (IMG 30) create a combination of **calmness**, which is also aimed for at Musakuutios Classrooms. Colour palette stays neutral and is brightened up with green upholstery and furniture.

The flooring in the classrooms is done with a Weber flooring solution which is a softer, acoustical material that creates more of a home-like feel to the classrooms. The dispute of maintenance issues in the beginning has caused damage to the existing flooring already. The staff noted that the clear cleaning instructions where not given to staff hence why the flooring suffered some damage (IMG 32) in the early stages of use. Other than that, I do believe the flooring gives **warmth** into classrooms which also have been equipped with carpets, couches and movable furniture.

Lockers in the hallways are sheered and preferated metal which work nicely together with the **exposed walls.** Musakuutio reference can be adjusted with the use of metal in the corridors and inspiration can be gathered by looking at the locker structures.

Keeping the building structure visible is executed successfully. Bringing in **pools of colour** with colour coding the corridors and areas of the building work as a good visual reference, especially to new visitors (IMG 29).

IMG 31



IMG 32

Acoustical elements such as acoustical panels, wooden slab ceilings and **acoustical furniture** were spread out the building evenly. The acoustics in the big dining hall were relatively good compared to the amount of concrete and hard surfaces. Ceiling panels (IMG 32) composed of **recycled materials** work as acoustical platforms in all the spaces around the building.

## 6.2. CONCLUSION

When specifying materials for the 3rd floor interiors at Musakuutio, I will focus on the durability of the materials and consider their maintenance possibilities. Some of the references seemed to lack those features and the wearing out of materials was reached in a short age.

Conceptually, if we look at the building as an instrument we need to focus on creating thrilling spaces and boosting emotions. I am aiming for a bold look that carries out through the classrooms and combines it all in the common areas. When looking at materials, the contrast between light and dark and soft to hard has to work as one of the main guidelines in order to achieve the space that talks to the users.

From benchmarking locations around the capital region and investigating international LEED accredited sites the importance of correct material selection has cleared.

From these projects I will take with me the key elements of ;

Durability,
Multi achieving materials and the amount of materials specified.

Focusing on these as qualifiers when comparing materials with LEED and scoring products is also based on their expected life cycle and maintenance options. By multi achieving materials I am referring to the ability of a material to work as both an acoustically performing material, the visual appeareance of it and the texture and/or warmth it provides. This is a key factor when the use of materials will be cut down to a minimum due to cost and documentation for LEED certification.

The amount of materials used in LEED projects is always quite low without compromising the design. Choosing the right surface finishes and furniture the end result can be beautiful even with less materials specified.

Focusing on the placement and horatio of materials combined I am aming to make the material choices for Musakuutio long lasting, comfortable and most importantyl, toxin free.



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# LEED V4
# 7. MATERIALS & RESOURCES



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# MATERIALS AND RESOURCES (MR)

PREREQUISITE

## STORAGE AND COLLECTION OF RECYCLABLES

- dedicated areas for waste haulers and storage for recyclable materials for the entire building.
- materials recycled must include: mixed paper, corrugated cardboard, glass, plastic, metals.
- appror. measures for safe collection of hazardous materials i.e. (min. 2) batteries, mercury-containing products(lamps) and electronic waste

PREREQUISITE

## CONSTRUCTION AND DEMOLITION WASTE MANAGEMENT

- creating a waste demo plan
- waste diversion goals for the project: identify at least 5 materials (structural and non-structural) targeted for diversion. Create an approximate of the percentage of waste created by project and how much of these the materials chosen represent.
- specify the process of recycling and what parts are recycled and how
- final report includes: detailed description of all waste streams generated; including disposal and diversion rates

?

These two prerequisites are considered already in the building phases and need to be evaluated according to LEED v4. standards.

Firstly, the storage and collection of recyclables has to be thought out in a way that it is convinient and easy for the end user. Recycled materials should be easy to maintain and store, also within the interiors. This requires more detailed planning of placement of rubbish bins, recycling stations and the furniture used for these. They should also be available for everyone to use both in the interiors and exterior waste management facilities. In the interior plans this will be taken into consideration by taking the placement and location of storage units for recycling and bins.

In the interiors and the construction process of Musakuutio the waste management needs to be configured prior beginning construction. Recycling plan has to be done in order to save raw material, minimize material use and land fill waste.

This can be done in the design process by dimensioning millwork plans correctly according to need and the general size of raw materials used. Pro-actively keeping in mind the possibilities of leftover wood and textile and the possibilities that how these can be reused or collected.

## 7.1. MATERIAL REQUIREMENTS

The Finnish Building code states that the furniture placed in educational buildings has to meet certain criteria when it comes to materials. Furnishings and finishes must stand more pressure, use and maintenance unlike our everyday domestic objects. They also need to be able to be re-furbished and re-cycled, just like in LEED and BREEAM materials category.

LEED & BREEAM are both aiming towards a non-plastic world that leaves the VOC's outside our environments. Comparing these two in what comes to materials the only common thing can be found in the needed long life-cycle and the ability to recycle the materials after use.

When comparing materials we have to evaluate **the life-span of a material** versus the material itself. When choosing non-organic materials we do tend to get solutions that last longer since plastic based materials are non-deteriorating.

The furnishings at Opinmäki School Complex (IMG33-35) have already seen vandalism and tearouts in after its opening in 2015. The furniture supplier uses fabrics that qualify for public space use based on their martindale ratings and fireproof levels. On the other hand though, the materials have not been able to withstand the use of almost a thousand children on their daily activities.

When designing for pupils of all ages the fabrics have to fill the Finnish prequisites for withstanding use and last throughout the operational age of the material (RT 47-10951 03/2009).

Materials to be cleared for Pop&Jazz Conservatory cover all floor, wall, ceiling and millwork. Also furniture and textiles have to be included in order to claim for an environmental standard certification.

When classifying furniture that needs to meet the standards we have to look at their **suitability for commercial projects**. Fireproof rating, upholstery Martindale ratings for stronger fabrics and easy maintenance all effect the life span of the furniture, too.


IMG 33


IMG 34


IMG 35



REQUIRED

## BUILDING LIFE-CYCLE IMPACT REDUCTION

In this case as a new construction project the only applicable option is to complete a whole-building life cycle assesment (Option 4.).

REQUIRED

## BUILDING PRODUCT DISCLOSURE AND OPTIMIZATION – ENVIRONMENTAL PRODUCT DECLARATIONS

Environmental product declaration (EDP) 1 point in cludes product specific declaration or focusing on the multi-attribute optimization for same amount of points.

## BUILDING PRODUCT DISCLOSURE AND OPTIMIZATION – SOURCING OF RAW MATERIALS

REQUIRED

**Option 1. Raw Material Source and Extraction Reporting (1point)**
At least 20 permanently installed products from five different manufacturers that supply a report from their raw material extraction.

**Option 2. Leadership Extraction Practices (1 point)**
At least 25% of the materials used have to meet one of the classified standards. Most relevant to Musakuutio all the wood products must be FSC certified and in order to gain the maximum scoring, manufactured within a 160km radius of project location.

BREEAM

Complies with BREEAM - prerequisites
MAN 03 Responsible construction practices
"All use of wood or products alike must be harvested and extracted according to legal measures. FSC or PEFC certified products automatically cleared. "

Since this thesis is only focusing on the interiors of the building, the LCA should be conducted prior the construction phase.

For Musakuutio the materials should be evaluated and their EDP clarified in the documentation phase. This means the materials chosen for the project should have a LCA by their manufacturer or a third party certificate to state the matter. The clarification doesnt include all materials used, but the more disclosed materials are used the bigger the chances of gaining extra points in the following categories is.

These requirements are mandatory in order to begin the certification process and are required in all projects alike.

?

Most of the classroom furniture was chosen from ISKU, a Finnish manufacturer that is open about their anvironmental values and processes. Their furniture meet the required ISO standards and their use of wood is PEFC certified.

All the items chosen from ISKU also serve to flexibility aspect since they are stackable and easy to move around.

All legs are finished black and table tops remain white to minimise light loss. The furnishings are kept in neutral tones within the brand colours.

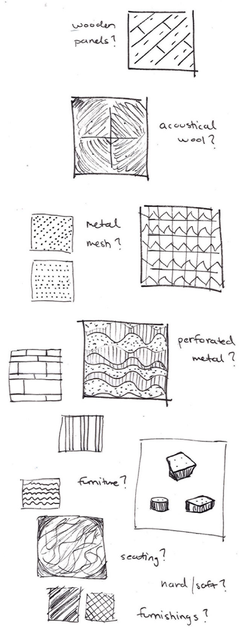


## TEXTILES & FURNISHINGS
MARTINDALE RATING
FIREPROOFING – CHEMICALS
M1 RATING

## 7.2. MATERIAL EVALUATION

| Space | Location of Use | Product | Symbol | Content | Finish | Installation | VOC | M1 Rating | Transport radius | Other Certificates |
|---|---|---|---|---|---|---|---|---|---|---|
| Instrumental Rooms | | | | | | | | | | |
| | Floor | Bamboo Plank | F1 | 100% Raw Bamboo | UV Lacquer Bona Natura | Floating | 0.005 mg/m³ E1 class | NO ! Floor score instead | Only manufacturer with a FSC label in Finland. | ISO 9001, ISO 14001, CE: EN14342:2013, Floor score |
| | Wall Acoustics | 3D Pixel Acoustical Tile | A1 | Wood Wool | Black Charcoal | Wall feature | Low | No, LEED equivalent | Sweden | LEED Gold |
| | Structural Wall | Unfinished | S1 | Concrete | Sanded, Sealed | Wall | NA | NA | Finland | |
| | Ceiling | Acoustical Ceiling Tile 600X1200 | S3 | Wood Wool | White | Suspended | Low VOC | YES | Finland | |
| | Luminaires | Aluminum, LED | L1 | Aluminum | White | Recessed | NA | LED | Sweden | Adjustable, Energy Efficient |
| Multipurpose Classrooms | Floor | Bamboo Plank | F1 | 100% Raw Bamboo | UV Lacquer Bona Natura | Floating | 0.005 mg/m³ E1 class | NO ! Floor score instead | NA | |
| | Wall Acoustics | Echo Panel 325 | A2 | Recycled Plastic, Bamboo | Charcoal Black | Wall surface | Low | NO, LEED equivalent | NA | Recyclable |
| | Structural Wall | Unfinished | S1 | Concrete | Sanded, Sealed | Wall | NA | NA | Finland | Existing Structure |
| | Ceiling | Acoustical Ceiling Tile 600X1200 | S3 | Wood Wool | White | Suspended | Low VOC | LEED | Finland | |
| | Luminaires | Aluminum, LED | L2 | Aluminum | Black | Suspended | NA | LED | Sweden | Adjustable, Energy Efficient, Dimmable |
| Common Areas | Floor | Concrete | F2 | **Finish on structure** | **Cement based Floor hardener, Dry,Matt Finish,** | **Structural** | NA | NA | NA | Existing Structue |
| | Wall | Acoustical Tile 600X1200 | S3 | **Wood Wool** | **Black** | **Wall installation** | Low VOC | LEED | Finland | |
| | | Metal Mesh Panel | S4 | **Aluminium** | **Black** | **Installed on top of S3** | NA | - | Germany | Only product available |
| | Ceiling | Same as wall application | S3+S4 | -;- | -;- | **Installed as a recessed ceiling** | -;- | -;- | -;- | -;- |
| | Luminaires | Aluminum, LED | L3 | **NA** | **Black Matt, Frosted Lens** | **Installed on top of Mesh** | -NA | LED | -Sweden | Adjustable, Energy Efficient, Dimmable |
| | Millwork | Oak | M1 | **Oak** | **Natural Wax** | **According to drawings !** | FSC LABEL | Furnishing: Yes | Finland | |
| Band rooms | Floor | Bamboo Plank | F1 | 100% Raw Bamboo | UV Lacquer Bona Natura | **Floating** | 0.005 mg/m³ E1 class | NO ! Floor score instead | NA | |
| | Wall | Baux Plank Tile | A3 | **Wood Wool** | **Oak** | **Wall feature** | Low | No, but a LEED equivalent | Sweden | LEED Gold |
| | Ceiling | Acoustical Ceiling Tile 600X1200 | S3 | **Wood Wool** | **White** | **Suspended** | Low VOC | LEED | Finland | |
| | Luminaires | Aluminum, LED | L2 | **Aluminum** | **Black** | **Suspended** | NA | LED | Sweden | Adjustable, Energy Efficient, Dimmable |

TABLE 6
MATERIAL EVALUATION






BDGC 1–2 POINTS

### BUILDING PRODUCT DISCLOSURE AND OPTIMIZATION – MATERIAL INGREDIENTS

REQUIRED

**Option 1. Material Ingredient Reporting (1 Point)**
At least 20 permanently installed products from five different manufacturers that use one of the allowed programs to showcase the inventory of chemicals of product to at least 0.1%. These are for example manufacturer inventory of porduct, C2C certification of ANSI/BIFMA Standard for furniture.

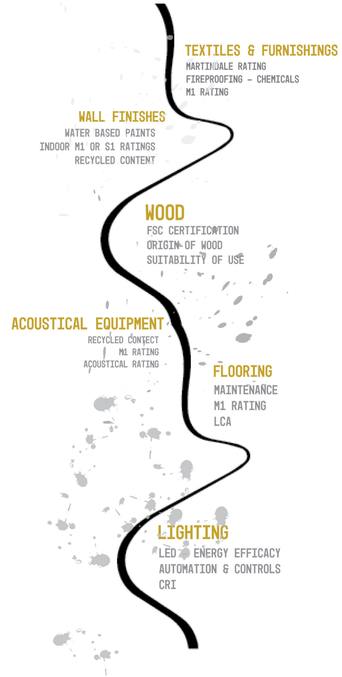
**Option 2. Material Ingredient Optimization (1 point)**
Using at least 25% of final installation products with a following screening that do vary in weighing for full closure of chemical content or C2C certification.

**Option 3. Product Manufacturer Supply Chain Optimization**
Using manufacturers with a transparent look into their supply chain processess or have a third party certification of the matter.

Materials evaluated in TABLE 8 have been rated based on their manufacturers declarations. For this project, a material that did not have any of the required documentation was left out of the evaluation immediately unless it was a one of a kind feature that cant be included into the guidelines given.

On the right you can see a small checklist for materials per type in what comes as the most important factor when specifying products and manufactors.

### 3 KEYS TO CONSIDER



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# LEED V4
# 8. INDOOR ENVIRONMENTAL QUALITY (EQ)



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# 8. INDOOR ENVIRONMENTAL QUALITY (EQ)

## MINIMUM INDOOR AIR QUALITY PERFORMANCE

PREREQUISITE

- The prerequisite aims for comfortable and healthy indoor air quality for the building occupants. I won't go into depth of the standards given here since they relate more towards a technological approach.
- This prerequisite includes requirements defined by ASHRAE in ventilation or in case Musakuutio, the European standard of CEN Standard EN 13779-2007 in ventilation is under observation.

## ENVIRONMENTAL TOBACCO SMOKE CONTROL

PREREQUISITE

- Preventing and minimizing building occupants exposure to tobacco smoke. It is required to provide signage for smoking areas and prohibit smoking inside the building. For schools, smoking has to be banned completely on site and it has to be informed on the property line with signage.

1–2 POINTS NEW CONSTRUCTION
1–2 POINTS SCHOOLS

## ENHANCED INDOOR AIR QUALITY STRATEGIES

REQUIRED

In this section the scoring can be achieved through creating ventilation calculations, designing proficient entryway systems and increasing, or adding, natural ventilation. For interiors this means providing grilles, grates or roll-out matts installed to main entryways which must be maintained weekly.

1–3 POINTS NEW CONSTRUCTION
1–3 POINTS SCHOOLS

## LOW EMITTING MATERIALS

REQUIRED

Reducing chemical contaminants in material selection. VOC (volatile organic compound) emission cut down in indoor air. In the following, the building interior includes **all material within the waterproofing membrane.** There are two options to choose from when aiming for points in this category; option number one aims for full product disclosure of emissions created and the second one focuses on the budget and the total percentage of products used. (see table_____)

By using the following materials when specifying interiors the amount of documentation can be cut down to the remaining if the ones chosen have not been coated or sealed with integral organic-based surfacings. These products can be classified in the non VOC content from the beginning. They include for example;

NATURAL STONE
CERAMIC
POWDER-COATED METALS
PLATED OR ANODIZED METALS
GLASS
CONCRETE
CLAY BRICK
UNFINISHED OR UNTREATED SOLID WOOD



1 POINT NEW CONSTRUCTION
1 POINT SCHOOLS

## CONSTRUCTION INDOOR AIR QUALITY MANAGEMENT PLAN

REQUIRED

This credit focuses heavily on the Healthcare section of LEED but does demand certain actions for New Construction as well. Implementing an indoor air quality plan for management which will be used during and before occupancy. This includes monitoring material storage on site, ventilation installation guides and smoking ban during construction.

1–2 POINTS NEW CONSTRUCTION
1–2 POINTS SCHOOLS

## INDOOR AIR QUALITY ASSESMENT

REQUIRED

Establishing better air quality throughout the construction and after the building has been occupied. This states for measures after all surfaces and furnishings have been installed.

Choosing one of the two options stating a before occupancy filtration equipment or air testing during building use for air quality.

1 POINT NEW CONSTRUCTION
1 POINT SCHOOLS

## THERMAL COMFORT

REQUIRED

Designing the building structure in a way that it meets the ASHRAE Standards required, or the local equivalent in thermal design and providing comfort. This stands for providing thermal controls for at least half of the spaces designed for individual occupants. Adjusting thermal systems with sensors or controls to accommodate spaces to meet ones needs of air temperature and humidity.

## 8.1. M1-RATING

Indoor Environmental Quality can be linked strongly to the Finnish M1 standardisation of materials. M1 standard focuses on building materials, millwork and furniture without upholstery. The label stands for low emission products that have been certified according to the Finnish Building Code RT 07-10946 (IMG 56).

When beginning the specification of materials for projects in Finland the first step can be looking at M1 acknowledged materials from the database. These are all certified and classified to be suitable for clean interiors with low emissions.

This label contributes to the MR and EQ partitions of LEED in low emitting materials, material ingredients and provides a base to research the EDP and LCA of products.


IMG 36

1–2 POINTS NEW CONSTRUCTION
1–2 POINTS SCHOOLS

## 8.2. LIGHTING

REQUIRED

Focusing on the occupant well-being by offering the spaces used high-quality lighting. This can be achieved with small measures through choosing one or two of the options below.

**Option 1. Lighting Control (1 point)**
Equipping building with a minimum of 90% controlled area in individual work areas and for shared spaces provide control systems that include a minimum of three scenes for lighting adjustments. These can at the simplest be ON, OFF and mid-level. Presentation walls must be separately controlled, all switches and manual controls located within the same space as the controlled luminaires with a view of controlled items.

**Option 2. Lighting Quality (1 point)**
When specifying lighting making sure all luminaires meet a CRI (Colour Rendering Index) of 80 or higher, ¾ of the luminaires chosen meet the 24000 hour rated life expectancy and assuring lighting calculations meeting the 1:10 illuminance ratio on the work plane we already have ticked three of the four boxes required. This can be achieved with smart lighting design and providing the team with light level calculations and LPD (Lighting Power Density) data for an uniform lighting plan.

Other options include minimizing direct-only lighting in all spaces and using the reflectance ratio on surface as 85% ceilings, 60% walls, and 25% for floors. This is modified a a tiny bit from the one normally used with the standard being 80% for ceilings and 10% for floors but doesn't affect the lighting levels calculations in a big scale.

BREEAM

Complies with BREEAM - requirements
HEA 01 - Visual Comfort
Glare control 1 point

### INTERVIEW PERSPECTIVE

When looking at LEED from the specification side, I interviewed Darren Ko, a specialist in lighting specification from Vancouver B.C. In Canada, LEED certified projects are in arise, with expected growth to continue. Over 400 certified projects in 2016 (Parkin Blog, 2016), it seems like Canada is growing the industry fast due to high demand from clients and tenants.

When specifying lighting, what are the first things you look for in a product when specifying for a LEED certified project?

*1. Must be LED.*
*2. Must be energy star.*
*3. Location of manufacturing.*

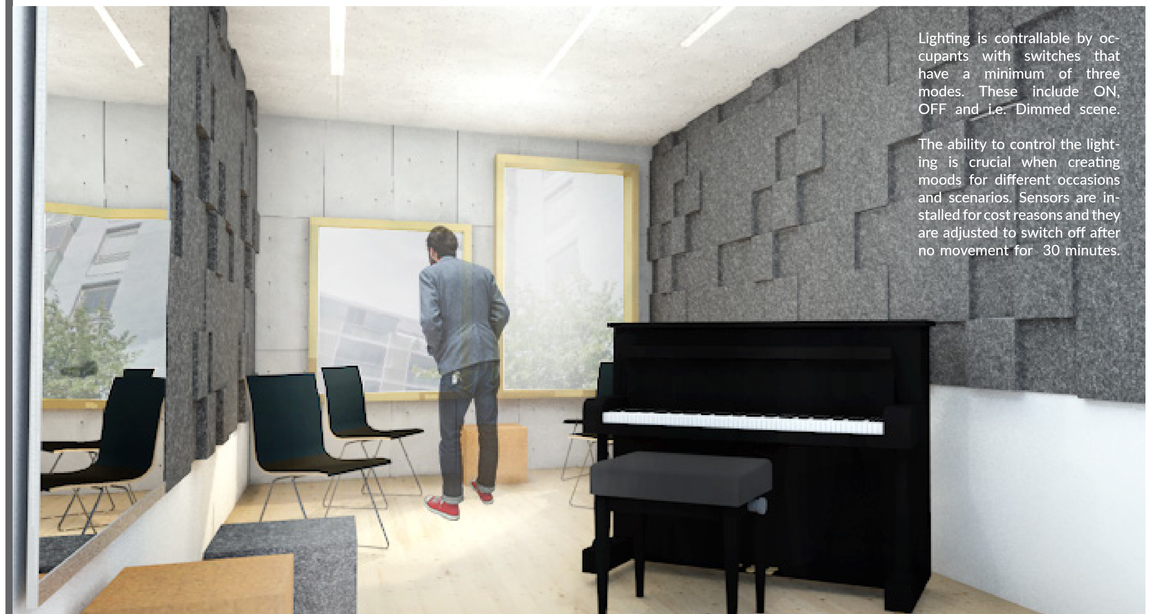
When looking at lighting controls, do you see a change in the clients perspective in what comes to adjusting the spaces with more controlled luminaires?

*Yes! Finally, people are seeing the benefits of controllability, and for reasons beyond comfort and feel of the space. When dimmed, not only is energy conserved, but the light source longevity is increase, therefore maintenance is decreased. For me, being able to dim and having automatic shut-offs are the most important.*

Understandably, the manufacturers are producing luminaires that will comply with the most recent ASHRAE standards when installed correctly following the LPD regulations. How does the design process work together with the specification of energy efficient fixtures?

*LED light sources are highly efficient now. I have not had any LPD issues when specifying LED products. In most cases you can still meet ASHRAE requirements and recommended light levels with fluorescent products, LED's no problem.*





Lighting is contrallable by occupants with switches that have a minimum of three modes. These include ON, OFF and i.e. Dimmed scene.

The ability to control the lighting is crucial when creating moods for different occasions and scenarios. Sensors are installed for cost reasons and they are adjusted to switch off after no movement for 30 minutes.

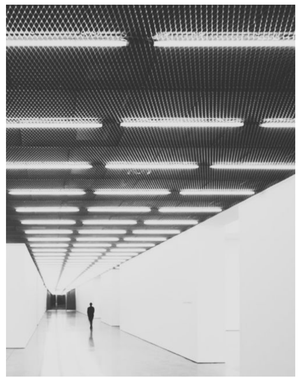
## LIGHTING DESIGN

For Musakuutio I specified lighting according to the latest LEED v4 energy requirements. The lighting plan is very simple, but kept interesting and efficient with the correct light levels and uniform lighting scenarios.

In Instrumental & Band Rooms lighting has been executed with recessed direct lighting due to the high level of acoustic surfaces. The surfaces dont offer enough reflection so the use of in-direct lighting would not comply with the needed light levels. The lighting scenarios are divided into two and the fixtures are also controllable by the occupants for maximum comfort. Interated lighting works also as a beneficial tool for easy maintenance which doesn't gather dust or dirt.

Multipurpose Classrooms have in-direct lighting combined with direct task lighting. Using a high reflectance ceiling surface the use of luminaires can be brought down to minimum and so forth improve the energy efficacy of the rooms. Using suspended luminaires in linear shapes we can create a fun pattern that works as a part of the visual appearance of the space.

Lobbies and hallways are combined with a lighting feature that talks to the visitors of the building. Keeping the surfaces rough with the metal mesh system we can integrate the lighting on the mesh. This is done in order to prevent the maintenance hazard and the dust effect that the material would gather if installed in the empty space between the structural ceiling and mesh. The dead space for ventilation and wiring is now used for acoustical tiling in order to achieve a better acoustical performance in the open atrium hallways.



IMG 37

### LIGHTING CHECKLIST FOR LEED V4.

CRI +80

RATED LIFE OF 24.000 HOURS OR L70 FOR LED'S

AIM FOR 1:10 ILLUMINANCE RATIO ON WORK SURFACES

USE SURFACE REFLECTANCE VALUES OF
85% CEILINGS
60% WALLS
25% FLOORS



### DAYLIGHT

1-3 POINTS NEW CONSTRUCTION
1-3 POINTS SCHOOLS

REQUIRED

Emphasizing the importance of daylight and circadian rhythms to our bodies and well-being. This credit can be achieved in the planning stages by simulating the sunlight exposure and get points based on the daylit floor area of buildings. Using either spatial daylight exposure and annual sunlight exposure stimulations or showcasing the illuminance levels throughout the day inside the building, excluding blinds or shades.

### QUALITY VIEWS

1 POINT NEW CONSTRUCTION
1 POINT SCHOOLS

REQUIRED

Quality views can be planned out in the design process of openings, architectural views and access to natural light. LEED v4. requires 75% of the spaces used regularly to have a view into the outdoors. Views into interior atriums can be calculated up to 30% of the requirements.

### ACOUSTIC PERFORMANCE

1 POINT NEW CONSTRUCTION
1 POINT SCHOOLS

REQUIRED

Like in the prerequisite 3: Minimum acoustical requirements, the HVAC background noise has to be calculated or measured to match ASHRAE, or in this case Huoneakustiikka - RT 07-10881 (01.10.2006). In this case, choosing between the two options to gain both points design should aim towards acoustical performance in both spaces and in finishes. For Musakuutio project the auditorium spaces are designed by an acoustical professional that evaluates the amount of acoustical solutions needed based on the design. I won't be defining the solutions required or how they are implemented in these spaces within this thesis.

In order to achieve the daylighting points in LEED v4. Musakuutio has to be equipped with sensors. The long history of benefiting from daylighting at Architects Tommila has been beneficial and eventhough the site itself is tricky with natural light the outcome works well with the variety of openings on the facades and the use of atrium skylights.

Quality views wont be succesfully achieved in the process due to the site but the atrium offers that space and view into the building and its core values, community and interaction. Acoustical performance has been a key factor from the start and it is achieved with the help of an acoustician. The acoustical tiles are installed behind the mesh that works as the feature in all the common areas. The thin mesh on top of the acoustical tile prevents the dust from gathering on to the panels that combine the ceilings to the wall finish.

Using the acoustical elements as the visual tool in the spaces rather than as a mandatory requirement we can benefit from a material that is required. Creating an artistic approach with the materials we can also save on wall art and other finishes. It also brings in colour and texture through the chosen paneling layout. Panels and tiles from manufacturers within the Scandinavian region create features that bring the colour flow of the new Pop & Jazz inside the classrooms.

# 9. DESIGN PROPOSAL

## 9. DESIGN PROPOSAL

Keeping the lobbies clean and classic with the resonance in mind, I have chosen the following approach to the design. All the materials have been evaluated previously in Material Evaluation, Table 6 on page 54.

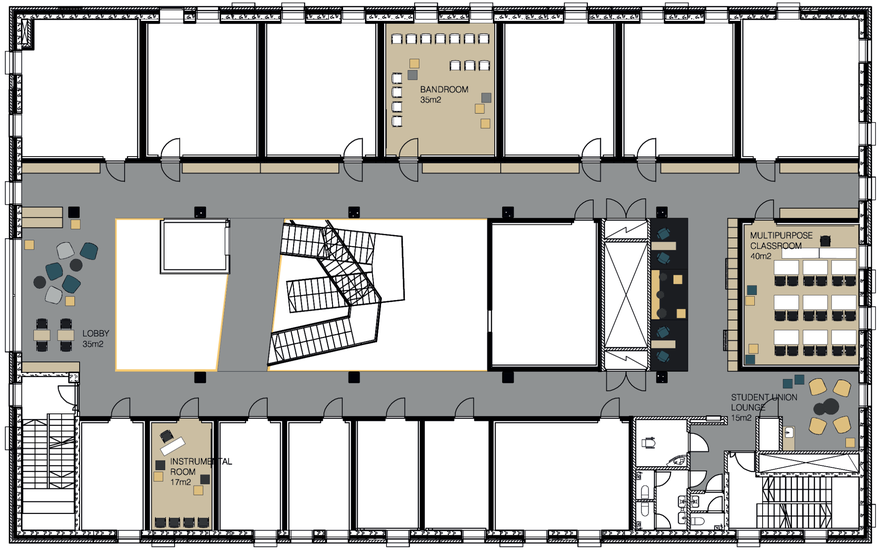
Using a metal mesh ceiling tile in 600x1200mm panels as a distraction between lighting and other ceiling equipment. Luminaires have been chosen so that they provide the best possible outcome for ambient lighting without compromising the light levels required. The metal mesh panel connects to the railings that wrap the whole structural package inside the mesh frame.

Common space flooring has been executed with the existing concrete structure. The structural concrete will be finished sanded and sealed from dust. Golden railings bring in that glam that was defined in the concept so the rest of the design has to obey the demanding palette it provides. Keeping the tones in the darker side we can create a mystical, modern medieval feel to the building.

Millwork has been added to the hallways and it includes different sizes, heights and seating nooks. These pieces are custom prefabricated for the location only and create the quiet light bays in the end of the corridors and the tiny pockets and jam corners throughout the floor. Using Oak as the wood material we can bring in warmth and create a more comfortable surrounding to all the end users. Combining the rough concrete with glam, wood and metal surfaces the atmosphere wraps you around the medieval theme with a modern groove.

### 9.1. ZONING




**CONCEPT PROPOSAL**
**FLOORPLAN & FURNITURE**

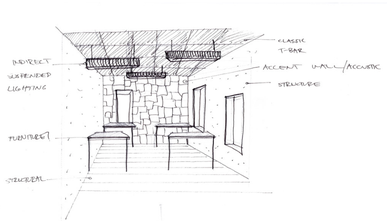
## 9.2. MULTIPURPOSE CLASSROOMS

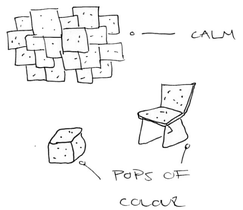
Classrooms required flexible, easily adjustable furniture that can be configured depending on the user and event. The space requirements were specified by the client and included workstations for 10+ students and teacher.

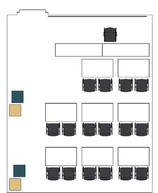
In the preliminary furniture floor plans you can see the different options of configuring the space. These instructions can also be given to the teacher in charge of the class in order to arrange furniture. The different scenarios are made possible by the stackable and easily movable furniture that can be arranged according to the use of the space when needed. The options given here are just examples of possible configurations in this certain classroo that has to have a minimum of 11 workstations at a time. The examples are shown with the maximum capacity of the space.

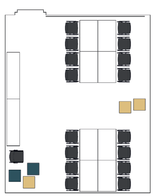
Materials chosen for the educational rooms follow the same palette as the other classrooms. Keeping the overall atmosphere calm with a high contrast to the common spaces the educational environment remains open for inspiration and creativity like stated earlier in Pop & Jazz Conservatorys core values. This also makes a certain psychological difference between the use of spaces for one. When spaces are specified with a certain theme the purpose of them comes automatically clear for the end user. In this case, the neutral scheme calms the environment and focuses on learning.

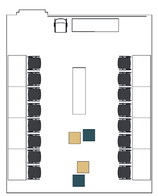
- CALM & RELAXED
- STACKABLE FURNITURE
- LIGHTING

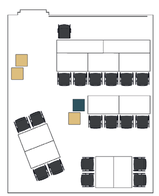




EXAMPLE 1


EXAMPLE 2


EXAMPLE 3


EXAMPLE 4



F1 BAMBOO PLANK
BAMBOO NORDIC
S1 STRUCTURAL CONCRETE
S3 ACOUSTICAL TILE
GYPTONE
A2 ACOUSTICAL PANEL
KIREI US
L2 LINEAR LED, SUSPENDED
FAGERHULT

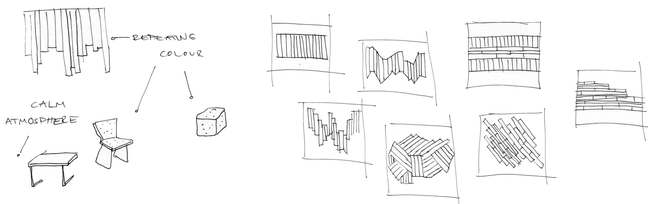
## 9.3. BAND ROOMS

The acoustical tile in the band rooms were chosen from BAUX Sweden.I chose the Baux Plank which is adjusted so that it creates a wavy pattern on the walls with an uneven rim around the room (IMG 38). The tiles are made of recycled wood wool and wood content and are fully re-usable or degrable.

The pattern is formed of a set of planks with a width of 1200mm. These units are then combined into a pattern that wraps around the room. The design effect was gathered from the traditional church organ.  The pattern was shaped into Pop & Jazz conservatory as a layout of acoustical tiling. Baux's acoustical tiles can be configurated in a variety of ways, and colours. The instrumental rooms can be colour coded in order to help guidance and navigation. This can be done in colours according to the new brand colours defined earlier.

The flooring is also done in the Bamboo Plank with the calmness of the rooms in mind. In these rooms the themes of rooms can be altered with colourful furniture and ottomans. All furniture is stackable and easily moved around the room for different user needs.

Lighting has been recessed into the acoustical ceiling tile from Gyptone. The basic 600x1200mm tile is centered with the luminaires.




IMG 38
BAUX PLANK

- COLOUR CODED BY ROOM USING POP&JAZZ BRAND COLOURS
- RECESSED LIGHTING
- ACOUSTICAL ART



F1 BAMBOO PLANK
BAMBOO NORDIC
S3 ACOUSTICAL TILE, GYPTONE
A1 ACOUSTICAL PANEL
BAUX SWEDEN PLANK
L1 FAGERHULT LINEAR LED
RECESSED



The bandrooms are colour coordinated to the new brand colours defined in Pop & Jazz Conservatorys new brand image. Using the tones in a bold way the image of the institution stands out for visitors that also are defined as users of the space.

Pointing out the ochre, deep green and strong pink the rooms are fun and easy to be in.

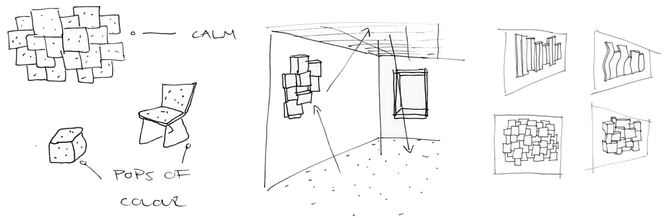
## 9.4. INSTRUMENTAL ROOMS

For the instrumental rooms the choice of flooring was the same as for all the band rooms and multipurpose classrooms. The Nordic Bamboos flooring was chosen due to its benefits in maintenance, durability and economical values. Investing into a long lasting flooring solution will be beneficial in the long run for Musakuutio. The flooring was chosen in the shade of Kaisla, which is the closest to the originally defined light oak. End result is clean and crisp and creates the calm, light colour palette into the educational spaces.

Combinition of white acoustical ceiling mesh and Swedish Baux Acoustical Tile art installations on the walls the space feels light and refreshing. Creating a 3D pattern of the Baux 3D Pixel acoustical tiles (IMG 39) in three different sizes the room gets character and depth with only three main materials used. Looking for inspiration through the shapes and corners just like the drumset would do for an artist.

Durable, classic toned materials are chosen to serve as the structure for the instrumental rooms and offer them a long lasting life in use. The colours used are kept neutral in contrast to the more colourful band rooms.

Lighting follows the same pattern as in the band rooms and is installed as recessed linear fixtures that can be dimmed and controlled by scenes created by the users.




IMG 39
BAUX 3D PIXEL

- ADJUSTED WITH COLOUR
- RECESSED LIGHTING
- ACOUSTICAL ART PANELS



F1 BAMBOO PLANK
BAMBOO NORDIC
S1 STRUCTURAL CONCRETE
S3 ACOUSTICAL TILE, GYPTONE
A1 ACOUSTICAL PANEL
BAUX SWEDEN 3D PIXEL
L1 FAGERHULT LINEAR LED
RECESSED

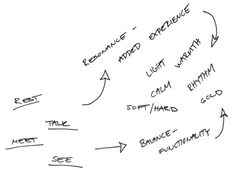
## 9.5. LOUNGES

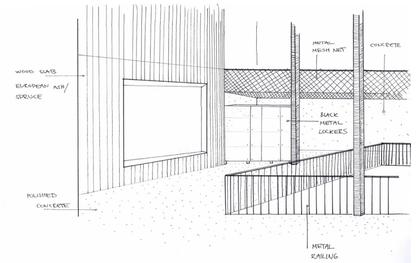
The lobby and lounge areas are created together with the architectural elements defined. The strong brass railings into the atrium create boundaries for design. Since we can look at brass as a long lasting solution eventhough its carbon footprint can add up to being bigger than LEED v4. would recommend, it is timeless and will with hold resistance, time and users.

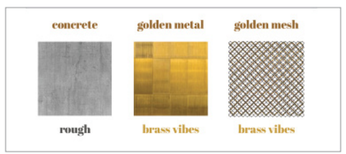
The wall paneling has been done with a base of acoustical tile in a darker shade of grey with a metal mesh paneling on top to create the right look concerning the concept. The structure wraps around the corners and on to the ceiling panels, too. This creates an illusion of material continuity and offers a solid back drop for other materials used.

Lighting products are from Viso and they are specified to be LED. This creates a good balance with the other Fagerhult luminaires in energy efficacy. The linear round tubes are formed into an uneven formation that works as a interest piece. The lighting can also be seen from different atrium levels so the focus on ceilings has to be higher.

Furniture is casual and invites people to sit, study and be seen. Creating surroundings for interaction and conversation the lobby and liunge urniture is casual and easy, providing different areas for these functions.



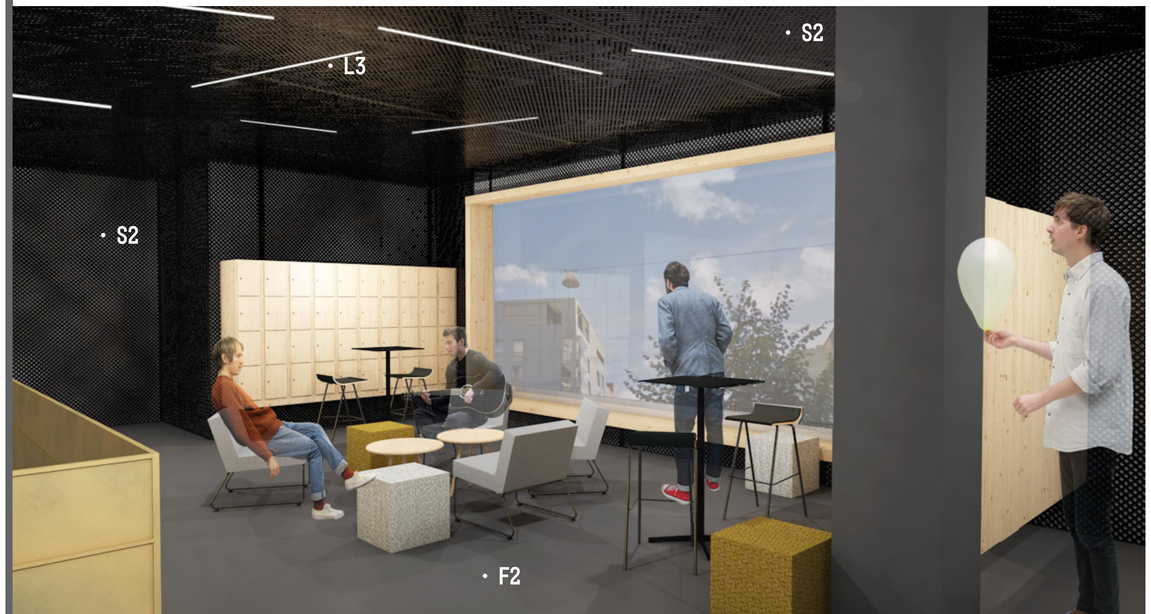




- DARK RESONANCE
- LIGHT ARRAY
- SEE & TO BE SEEN
- ZONES OF COMFORT



F2 STRUCTURAL CONCRETE
SANDED AND SEALED
S2 METAL MESH PANEL
L3 VISO LUMINAIRES LED
ROUND LINEAR, ON SURFACE



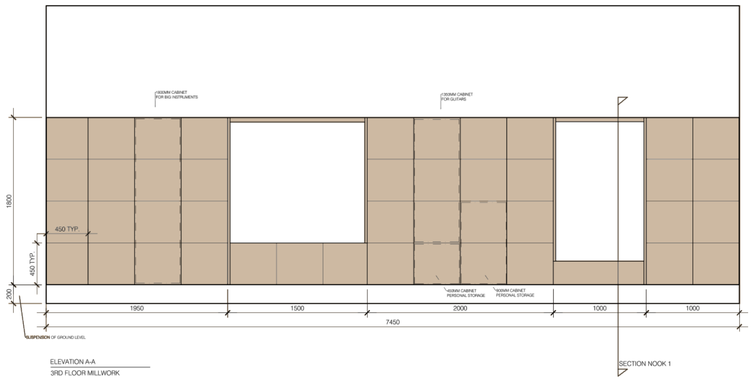
## 9.6. MILL WORK

Mill work in the hallways is built in order to store the needed equipment. It also offers warmth through the wood and the specialty nooks it provides. The design process culminates to avoiding unnecessary dust corners, easy maintenance and locks for privacy. Handles should be integrated into the mill work without gaining much attention.

Smallest size of lockers should fit a laptop and the biggest, instrumental lockers, need to fit guitars, violins and other string instruments alongside the drum maintenance cabinets. The cabinetry solution includes three different sized storing units that are placed behind the cubic front paneling. This creates an illusion of multiple small locker units when in reality the cabinets open by multiples.

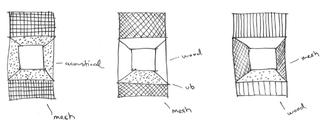
I have chosen the mill work to be both full cover on the floor and also suspended from the wall structure without additional legs. This creates an illusion of space, layers and attraction which can be multiplied from the facade design.

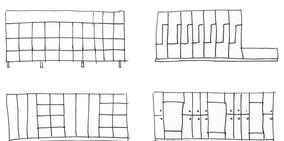
Nooks are created in order to provide students and staff acoustically comfortable stops on the way to class, as waiting areas and as places to focus on calls and work. Hence why the nooks all have acoustical performance of a quiet working space with wooden structure and furnished seating.




ELEVATION A-A
3RD FLOOR MILLWORK

SECTION NOOK 1





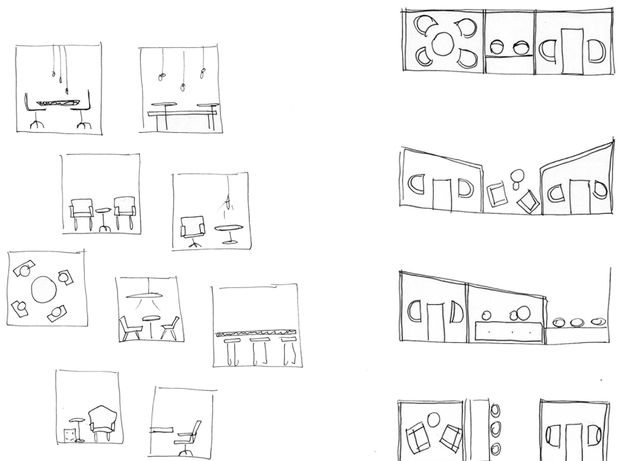
## 9.7. TUTOR WORKSPACES

The space in the hallway offered a perfect location for some needed quiet study rooms and areas for one-on-one tutoring. The space itself had room to fit three small booths that comfortably fit two adults at a time. These rooms can be used by the Pop & Jazz educational staff and students, alike.

The glass structure can be implemented through lighter panel booth options or as a structural frame. Facing the storage and seating solution the balance between the two works well. The seating nooks in the millwork offer a good waiting area before getting in to tutoring session or a good debrief afterwards. Also, the tutors and teachers can store their belongings in the storage included in the millwork so that it is easily accessible for the small scale meetings.

Furniture is kept simple and functional and the acoustical side of booths should be adjusted to create quiet areas of importance.

- QUIET WORKSPACES
- STUDY AREAS
- WAITING NOOKS
- STORAGE





## 10. DEVELOPMENT

As the project continues to develop further and I will be working with it in the following months the process of design and the choices made in this thesis will be under evaluation. I believe I achieved a thesis that can work as inspiration and as a tool in the long run.

Despite the difference between my proposal and the current state of the design, I see the investigation between LEED and the factors of materials to be considered when eventually specifying them.

I maintained in my personal design on the side in this thesis when the projects design developed towards a more traditional style to work with all participating parties. In order to achieve the concept I chose to proceed with the interior scheme that works as the instrument of the building. I still see the previously introduced concept as a strong character for the building and as a vital part of the project.

### 10.1. RESULT

The end result is a positive outlook on the possibilities of LEED and showcases that interiors do not fall into a certain stigma of being environmentally friendly. The possibilities of LEED more so give than take from the design process. When working between guidelines given by a third-party the process can be a lot quicker, more efficient and easier for the client and the designer. More so, I hope that this thesis can offer useful guidance into the world of environmentally friendly materials in our field of design.

I believe that the design proposal works well with the defined concept and offers a joyful insight into the world of Pop & Jazz Conservatory through their new brand image and premises. Following the division of styles given with calmness in the classrooms and dark resonance in the common spaces the end result is pleasing and supports the values defined by Pop & Jazz Conservatory, too.

Most importantly, I would like to thank Architects Tommila, my instructor Merita Soini and KP, the class of 2018. Thank you for your endless support in the process of chasing the LEED accredited dream.



RESONANCE.

# 11. GLOSSARY

**LEED**
A non-profit green building certification program developed by the U.S. Green Building Council.

**USGBC**
U.S. Green Building Council.
Third party organization that works together with sustainable buildings, contractors, real-eastate developers and neighbourhoods.

**BREEAM**
Building Research Establishment Environmental Assessment Method.
Developed by the Building Research Establishment in the 1990's to certify buildings and their sustainability.

**LCA**
Life cycle analysis.
Examines the environmental impacts assosiated with a product or a material.

**Cradle to Cradle**
Biomimetic design approach that focuses on matter working as a part of the natures process throughout its life span.

**EDP**
Environmental Product Declaration.

**FSC**
The Forest Stewardship Council promotes responsible forestry as a international non-profit oraganisation.

**LPD**
Lighting Power Density describes the technical load of lighting in a certain area or the watts given per square meter.

**CRI**
Colour Rendering Index

**VOC**
Volatile organic compounds are organic chemicals that are contained in materials.

**GRI (sustainability report)**
The Global Reporting Initiative provides independent organisational help in understanding climate change issues.

**ANSI**
The American National Standards Institute certifies and evaluates materials i.e. within the United States for international trade.

**BIFMA**
Business and Institutional Furniture Manufacturer's Association is a trade association for business and institutional furniture manufacturers.

**Organic**
Matter that has developed from a once-living organism, can decay or be a product of it, or is made of these ingredients.

**Bio-based materials**
Intentionally made of once-living organisms and parts which can be referred to as biomaterials. Typically, materials referred to have gone through a long process of finishes.

**Biotic Material**
Materials that are bio-based but have not been processed.

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# 13. CREDITS

## image credits.

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IMG 1 Architects Tommila
IMG 2 Pop & Jazz Conservatory
IMG 3 Metropolia, http://muotoilu.metropolia.fi/wp-content/themes/muotoilu/assets/theme/images/metropolia-logo@2x.png
IMG 4 Architects Tommila
IMG 5 Pop & Jazz Conservatory
IMG 6 Pop & Jazz Conservatory
IMG 7 Architects Tommila

IMG 8 INSPIRATION COLLAGE
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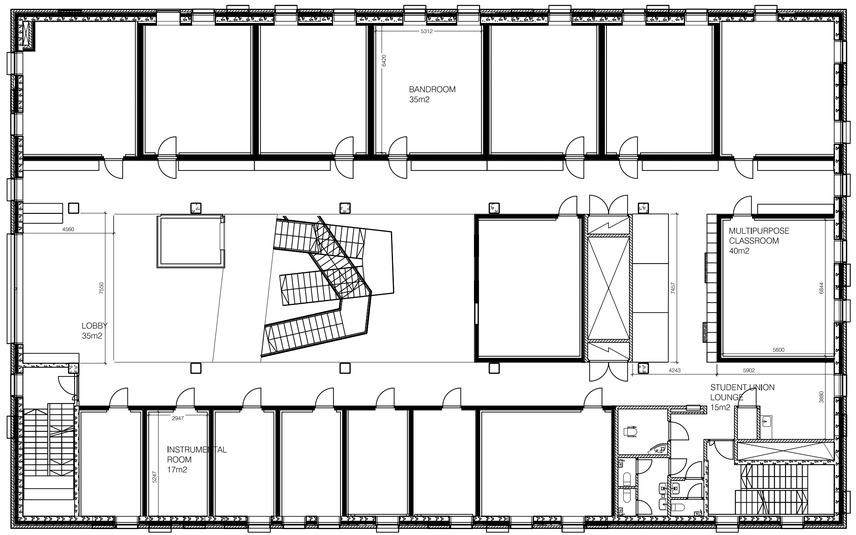
Table 3
Ramboll Consultants

## attachments.

A1 Drawing package
A2 Interview Questions

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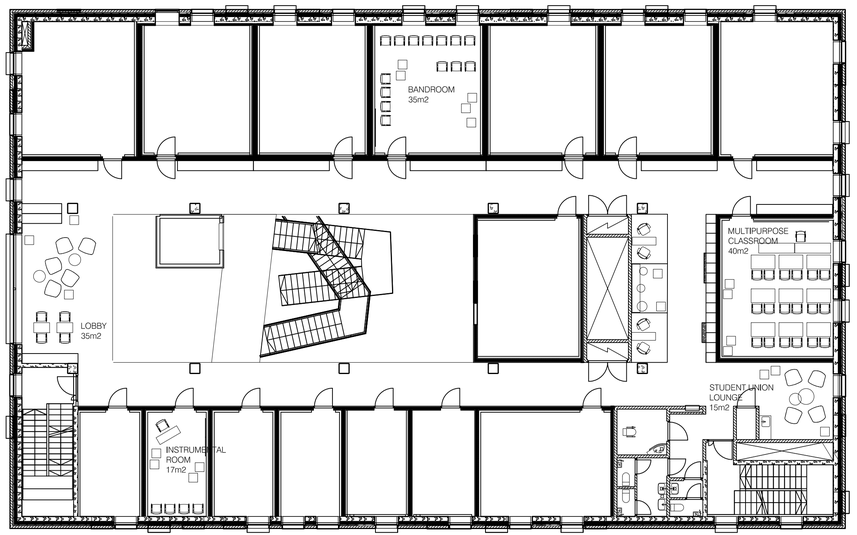


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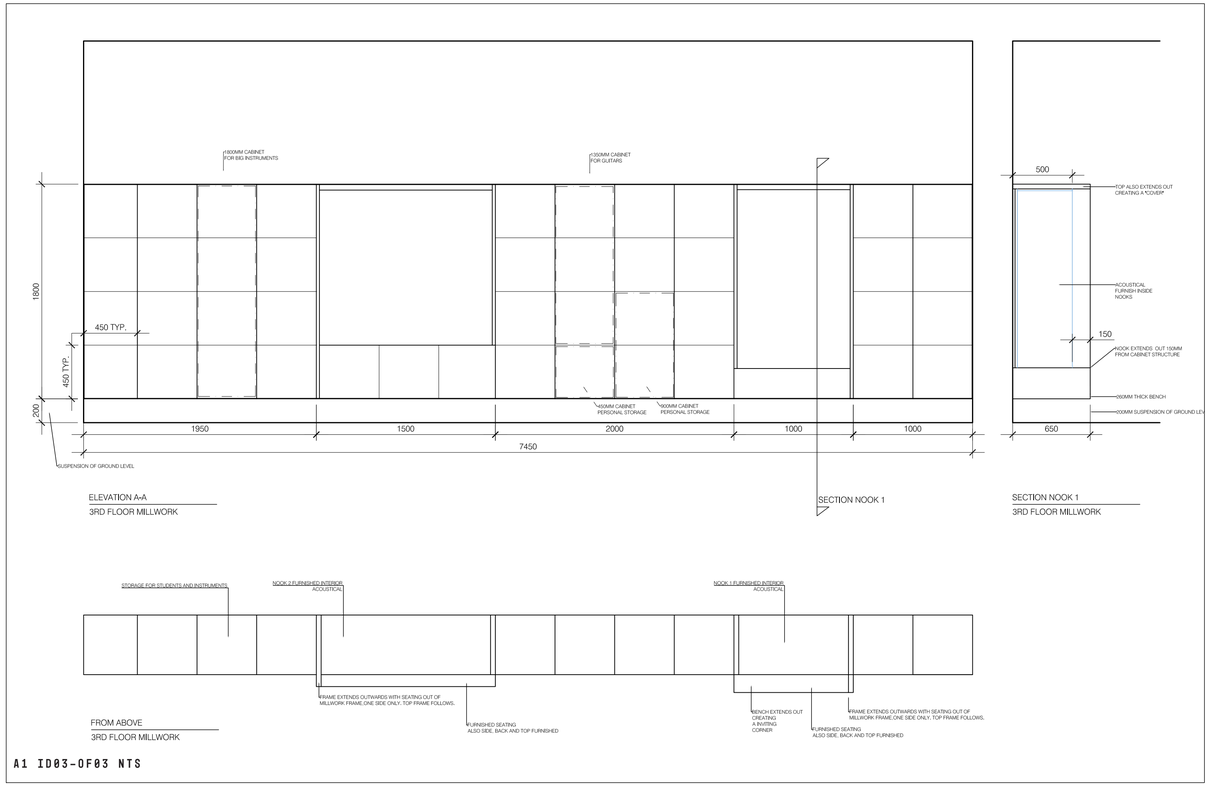


A1 ID03-OF03 NTS



## Interview Questions

Darren Ko - Symmetry Lighting
Lighting Specialist

*These questions are focused on lighting and specification of them in New Construction and Interiors. This thesis work focuses only on the benefits gained through interior solutions that comply with the most current LEED v4 for Interior Design and Construction and the local energy code of Finland.*

1. Have you qualified for LEED AP?
2. Do you feel like LEED i.e. environmental standards contribute to the industry in a positive way?
3. When looking at lighting controls, do you see a change in the clients perspective in what comes to adjusting the spaces with more controlled luminaires?
4. Understandably, the manufacturers are producing luminaires that will comply with the most recent ASHRAE standards when installed correctly following the LPD regulations. How does the design process work together with the specification of energy efficient fixtures?
5. As a professional, do you feel like the lighting design industry is leaning towards a more minimalistic design approach in new construction due to the strict standards defined in ASHRAE?
6. In your opinion, has the need for automated lighting solutions grown in the past few years?
7. Can you define any specific trends that have developed around the green building industry, especially in lighting?
8. When specifying lighting, what are the first things you look for in a product when specifying for a LEED certified project?

## Interview Questions - Musakuutio

Jonna Seppänen - Ramboll
MSc, BREEAM Assessor, BREEAM AP
Green Building and Sustainability Consulting
Kiinteistökonsultointi

*These questions are focused on BREEAM and the specification of materials in New Construction and Interiors. This thesis work focuses only on the benefits gained through interior solutions that comply with the most current LEED v4 for Interior Design and Construction and the local energy code of Finland.*

1. How did you start your career as a BREEAM professional?
2. Does the certification process for BREEAM occasionally interfere with the design process?
3. Do you feel like LEED, BREEAM i.e. environmental standards contribute to the industry in a positive way?
4. When looking at the certification process, do you find it difficult to explain the matter to your clients? What areas/topics cause the most confusion with architects and designers?
5. What do you think is the biggest benefit for the investor in applying for BREEAM certification in a new construction project?
6. Can you define any specific trends that have developed around the green building industry, especially in the material choices made in BREEAM certified projects?
7. How is the relationship and knowledge base with investors and contractors on environmental certifications? Are they well known or mostly unknown?
8. How do you see BREEAM developing in the future? How does the future look like for environmentally friendly buildings?